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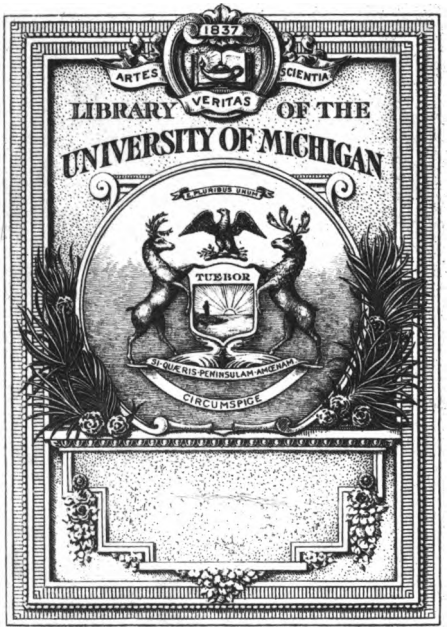

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TRANSACTIONS

OF THE

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OF GLASGOW

(INCLUDING THE PROCEEDINGS OF THE SOCIETY).

VOL. VI. (NEW SERIES.) PART II.

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TRANSACTIONS

OF THE

Natural History Society of Glasgow.

Extracts from an unpublished Ornithology of Glasgow.

By the late Dr. JOHN GRIEVE, with Notes by JOHN PATERSON.

[Read, in part, on 26th March, 1901.]

THROUGH the courtesy of Dr. G. Burnside Buchanan, there came into the possession of the Society recently a very interesting little work on the Birds of Glasgow, in manuscript, by the late Dr. John Grieve (regarding whom see an obituary notice in our *Transactions*, Vol. IV. (N.S.), p. 357). This little work, which has remained unpublished, bears a title page as follows:—

ORNITHOLOGIA MILLBURNENSIS:
THE ORNITHOLOGY OF GLASGOW;
COMPILED
FROM OBSERVATIONS MADE AT MILLBURN
DURING A SERIES OF YEARS,
BY JOHN GRIEVE.
GLASGOW:
1847.

With this there also came to the Society some loose sheets, evidently notes of an address on the same subject, but, unfortunately, incomplete in respect of a few pages at the beginning. I believe the part lost to have dealt with the Peregrine Falcon, Sparrow-Hawk, Kite, Hen-Harrier, Rook, and in part Jackdaw, being the first half-dozen species in the complete list.

The Birds of Glasgow is a work yet to be undertaken. In the meantime it may be said that local ornithologists owe some gratitude to Dr. Grieve's memory for the admirable example he has set to them in the work under notice.

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The area of observation is thus described:—"The north-east boundary of Glasgow is formed by the Germiston Burn, from where it passes under the Garnkirk Railway, or what is now called Caledonian, it winds round under the Monkland Canal away east a small bit, and then due west to the High Church, where it turns southward as the Molendinar, and here ceases to be a boundary line. Before passing under the Monkland Canal it runs through the grounds of Millburn where the principal observations were made. It is surrounded by the gardens of the neighbouring gentlemen, and is within ten minutes walk of one of the principal thoroughfares of the city. The data from whence the following observations were made were duly registered there for a series of years, and though repeated excursions were made round the city to a distance of three miles or so outside the boundary, no other birds were discovered but what have been seen at some time or another at Millburn."

Though dated 1847, the work is based on a journal kept during the years 1843, 1844, and 1845. The birds enumerated number about 56 species, and are as follows:—Peregrine Falcon, Sparrow-Hawk, Kite, Hen-Harrier, Rook, Jackdaw, Magpie, Jay, Starling, Fieldfare, Song-Thrush, Redwing, Blackbird, Pied Flycatcher (marked?), Sedge-Warbler, Garden-Warbler (marked?), Whitethroat, Redbreast, Reed-Warbler (marked?), Lesser Pettychaps, Yellow Wren, Gold-crested Wren, Wren, Whinchat, Hedge-Sparrow, Pied Wagtail, Grey Wagtail, Yellow Wagtail, Tit-Lark, Sky-Lark, Wood-Lark (marked?), Greater Titmouse, Blue Titmouse, Yellow Bunting, Bullfinch, Green Linnet, Sparrow, Chaffinch, Brown Linnet, Canary, Red-headed Linnet, Goldfinch, Cuckoo, Chimney-Swallow, Sand-Martin, Martin, Swift, Ring-Dove, Partridge, Lapwing, Snipe, Corn-crake, *Larus* (various species), *Anas*.

Of the Peregrine Falcon, he says: "A bird called the Blue Hawk by gardeners is said to be seen here occasionally," but he was unable to satisfy himself about it. The Sparrow-Hawk "is the only bird of prey we can boast of as a residenter. It is frequently seen gliding leisurely over our fields. . . . I have never been able to find out their nests here, though I think it very probable that they build on some of the old trees at the top of the quarry at Craigpark."

Of the Kite, a species quite unknown in the Glasgow district at the present time, one is almost surprised to read that "it is

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not so common here as the preceding, still it is often enough seen flying over our fields. . . . I have never heard of any of their nests having been found near the city, though, as they build chiefly in trees, they may only have escaped observation." Within a decade or two of the years covered by Dr. Grieve's diary, this splendid bird must have vanished pretty completely from the Glasgow district. The Hen-Harrier he had seen only once. "It was in the August of '43, when walking along the Germiston Road, near Provan Mill, I observed one of these birds, within twenty yards of me, flying leisurely over a corn field, just about a foot above it, beating every corner of it with great assiduity. . . . ." Surprise is expressed at no owl coming under his observation, though he had looked and listened carefully at night for one. "The Cathedral might be a very fit place for a pair to take up their abode."

Of the Rook it is said that "they are not generally considered here to cause much destruction by turning up the grain. . . . This view being more generally held now, they are considered more welcome, and are allowed to breed, while formerly every attempt was made to cause their destruction. . . . This town, in former days, could boast of large rookeries. The only one that now exists is that in the College Green, reduced to a few dozen nests, though once the largest, and certainly a more favourable spot could not be had—besides the number of trees and full scope for their quarrels, being protected by the Laws of the University, by which any one was punishable for meddling with or annoying them. Notwithstanding, they were gradually becoming less numerous. One used to exist at the head of Queen Street, around the house of one of the M.P.'s for the city, who got nicknamed in consequence ['Craw Ewing'].* When his house was taken down to make room for the present terminus, the trees were felled likewise, but whether they formed an alliance with their University friends or took up a new abode cannot now be so easily determined. One pair built regularly on a tree in a back green of one of the houses on the south side of West George Street, but that being felled two years ago, they, too, have left the city. A few still build at Possil, and here and there several nests may be seen, probably exiled for some misdemeanour."

* See "Trans. Nat. Hist. Socy., Glasgow," Vol. IV., N.S., p. 276.

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The Jackdaw "is by no means a common bird in this neighbourhood — numbers build out at Pollokshaws, and give us an occasional visit."

The Magpie in spring is generally seen in pairs, but "towards the end of September flocks of 6 or 8. . . ." "I have never seen their nests here, but am told that they build about Craigpark and some of the adjacent woods." The egging propensity of this species is much commented upon.

The Jay had only come under observation once, viz. :—"on the 14th December, 1844—during a time of hard frost—at the Burn."

The narrative given by Dr. Grieve, relating to the great encouragement given to the Starling at the time he is writing of, deserves to be quoted pretty fully, as an interesting contribution to the history of the increase of this now very common bird. "Few birds receive more encouragement to build than does this one. On the roofs of almost all the houses hereabouts boxes are placed for them to build in, and though the young brood are not infrequently taken away they continue to frequent them year after year. These boxes are made about 18 inches long and 10 broad at the back, while at the front it is reduced to 6. The door or hole for entrance is made very small, and no larger than will admit the bird. They are nailed up by the side of the chimneys, or in the fork of a tree, the former being considered the more agreeable by the birds, and probably so from the warmth of the chimney. . . . During winter they are to be seen in flocks, and do not generally resort to the boxes for sleeping quarters. The number of boxes appear to regulate the number of birds, as when they are taken down in winter and not put up till the birds have been seen looking for suitable nest places, they are seldom so numerous as when the boxes are left up. . . . There appears to be a slight mania in the starling box line among our neighbours, which will probably subside in a few years, and then the bird may become more rare. A few build about the Cathedral." The extent to which this guarded forecast of the "subsidence" of this species has been falsified, is a matter of common knowledge.

Under the heading Fieldfare, a narrative is given of its nesting at Millburn, but subsequently the confusion into which the author had fallen between this species and the Mistle-Thrush

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had been discovered, and the manuscript bears a pencil jotting in the margin to this effect.

The Song-Thrush is "very numerous here. . . ." "It generally begins to sing about the end of January (January 27), and continues on to the end of July (July 27), sometimes even to the 10th or 12th of August."

The Redwing "arrives here with the Fieldfares, about the middle of October, and remains to the middle of March."

The Blackbird "commences to sing about the beginning or middle of February, and continues on to the end of July or beginning of August—(February 17—July 27, August 10). . ."

The nicety of Dr. Grieve's observation is well illustrated in his description of the economy of the Spotted Flycatcher, regarding the identity of which he had had for some time a little difficulty, but, as he says, "the spotted appearance of the young bird can hardly be mistaken," which is a good point. A pair built for two successive years at Millburn "in one of our walled pear trees," and our author states further "I have found it among some of the pine woods in Bute. . . . It has a low, sweet song, which it generally utters on the extremity of a small spray, where it sits perched looking for flies, and then pouncing on them as they fly past. . . . I have generally heard it first about the beginning or middle of May, and seldom seen it after the middle of September. . . . They were seen first this year (1844) on May 24th, and not after September 19th. One of the young ones had three toes of the left foot wanting. . . . On 29th June, 1843, there were 4 eggs laid in the nest, one daily on the three preceeding days, and the nest occupied two days in building. July 12, has sat 12 days. July 21, young 10 days old—so that incubation lasted only about 12 days. . . . On the 24th they flew."

The Sedge-Warbler "is sometimes met with at the Mill dam on the Town Mills' Road. . . ."

The Garden-Warbler "arrives here about the end of April, though is seldom heard here before the middle of May, and leaves in August. I have heard it here on the first week of September. . . . I saw the bird here first on 5th of July, 1843, but, after a careful search, could not fall in with its nest. Next year, however, I found the nest in a currant bush about four

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feet from the ground, on the 14th June. On the 17th it contained four long-shaped eggs. . . . On the 28th the young were hatched, that is allowing 11 days for incubation. . . . On July 8th the birds flew after 10 days' nutrition."

Of the Common Whitethroat it is said that "they are pretty frequently seen here, and breed down at the burn. . . . They breed pretty early here, as I found three of them newly flown on 26th June, 1843."

The Redbreast "is quite common here all the year round. . . . It may be seen singing on the top of a stob or any exposed place during a heavy fall of snow, or hopping about and twittering with its wings flapping its sides. . . . I have heard the robin singing as it flew from bush to bush."

The Reed-Warbler is entered in the complete list with a mark of interrogation. It does not appear to rest upon his own observation, and its insertion is a mistake in any case.

The Lesser Pettychaps or Chiff-Chaff is "heard first about the middle of April, and rarely after the beginning of September. . . . It is one of our rarest summer visitants." One would have liked something fuller regarding the occurrence of the Chiff-Chaff, and it is a little disappointing that Dr. Grieve's acquaintance with the Willow-wren was limited to his having seen it "several successive years here, generally about the beginning of August." Has the Willow-wren become so abundant since 1845?

Of the Gold-crest, our author writes—"While out walking among the shrubbery at Millburn, before breakfast, on the 29th September, 1844, I fell in with this beautiful little songster. I had never seen it here previously, and willingly followed it from bush to bush till I had obtained several near sights of it, and was convinced that it was a veritable Gold-crested Wren. The song was very low, but broke out loud at the end, terminating very like that of the Chaffinch. . . ." A good description!

The Wren "is to be seen almost everywhere. . . ."

Of the Whinchat—"I have occasionally met with this bird among the whin bushes around the sand quarry." ["M'Ilquham's," according to the notes of an address, *ante*, p. 182], "on the other side of the Burn. . . . It is very common about Dunoon and Rothesay. . . . It arrives here about the end of April, and is seldom seen after September."

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Of the Hedge-Chanter [Sparrow], "They are very numerous here, and are easily caught in the common brick trap. . . . I remember catching one which had a cataract in the left eye."

The Pied Wagtail "is common here all the year round. . . They keep up a most agreeable inward chatter when looking for food—and are generally more plentiful in the neighbourhood of those streams to which washerwomen resort, the insects being attracted by the soap suds—whence one of its common names [Washerwoman]."

The Grey Wagtail is "not near so common here as the preceding, in company with which it is sometimes seen. Its song is not so loud. . . ."

The Yellow Wagtail, "certainly the most elegant of the Wagtails—having the longest tail [a mistaken idea, this being the distinction of the Grey Wagtail]. . . . It is, however, the rarest, being only occasionally seen here. It is, however, very common in other parts of the country, from which it pays us a passing visit generally for a few days in August. . . ."

The Meadow-Pipit alone among its congeners is mentioned, but a perusal of Dr. Grieve's description of its habits proves that the Tree Pipit was also under his observation, although he failed to distinguish the one from the other. This is a common mistake in old writers, as Pennant, Gilbert White, &c.

In his account of the Sky-Lark, he gives a curious narrative of a wild brood he put in a cage on the outside of his window, where they were attended for several days by their parents.

As so often happens in old lists, the Wood-Lark appears, in this case upon the authority of "a lady," but, as the author properly says, "probably wrong."

The Great Titmouse and Blue Titmouse were very common. Of the former, it is said "it has a nice song which it commences early in February, sings through March and April, and resumes again for a short time in September."

The Yellow Hammer "generally commences to sing about the 20th or 23rd of February, and sings on to August 18th, or even 26th, and again from about September 20th to the end of the month. It is not uncommon on the fine clear sunny mornings of September to hear many of the young birds going through part of their song, as I said already of the young larks."

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Of the Bullfinch little is said, it having been observed only once. The Green Linnet was "common everywhere."

A long account is given of the House-Sparrow, and of the behaviour of a pair which he reared in confinement. "By degrees the one which appeared to be the hen grew black, and after her first moulting became jet black, like any crow, with two white spots on the wing."

An interesting account of the Chaffinch follows that of the Sparrow, but our space will not allow of the quotations one is disposed to make.

The "Grey Linnet is seen here in large flocks during the winter months—numbers of them are caught then for the market, where they are sold at 4d. each or so."

The Canary, hens of which are "let away by unprincipled people or escape," calls for no notice here.

Of the Lesser Redpole, a few "are occasionally, though rarely, seen with the flocks of Grey Linnets during winter."

The Goldfinch, which is described as being "so common in many parts of the country, is rare here, as he only pays us an occasional visit after a winter storm, or the end of autumn when the thistle seeds are flying about in numbers."

Regarding the Cuckoo, nothing of importance is narrated.

The Swallow "arrives here from about April 17th to 25th, and remains with us to about September 26. . . . They have generally two broods in the year."

The House-Martin "arrives about the same time as the former, April 23rd, and remains to September 26th. . . . This bird is generally to be found with its nest in the window corners and eaves of houses, and generally to a northern exposure. The nests being thus protected from cracking by the sun's rays, and less exposed to destruction from heavy rains, which very easily undermine the fragile materials of which they are composed. . . . Their nests are to be found on almost every window fronting the Clyde." This species is described in the notes of an address before referred to (*ante*, p. 181), as "much more common" than the former. The statement is interesting in view of the opinions frequently expressed about the recent decrease of this species in numbers in various Scottish districts. A pair or two may be found nesting at the present time from a mile and a-half to two miles

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south of the river (for the north side I cannot speak), but this is a very different story from that told by Dr. Grieve.

The Sand-Martin, our author says, he has repeatedly watched "at the sand quarry on the other side of the Germiston Burn. . . . About half-a-dozen pairs build here annually. . . . They generally arrive here about the 17th of April, and are seldom seen after the 26th September."

The Swift is described as "seldom arriving before the beginning of June, and leaves about the 26th of August, . . ." but it is well known to recent observers in the neighbourhood to appear regularly a month earlier.

The Ring-Dove was an occasional visitor, and, " . . . one year a pair built on a tree at the Germiston Burn, just where it passes under the Garnkirk Railway."

The Partridge was occasionally "seen in flocks of from 6 to 12 during the month of September and the early months of spring, especially in pairing time—for this bird is one of those that pair early."

Of the Lapwing, "stragglers from Hogganfield and the neighbouring mosses not unfrequently pay us a visit, especially in wet and stormy weather, and during spring. . . ."

A Common Snipe, which was first seen "in one of our ditches" on the 14th December, 1844, was the only one that came under Dr. Grieve's notice.

The Corn-crake was seldom heard at Millburn before the beginning of June, but this would be a month at least after its arrival in the district generally.

The Gulls seen were not distinguished specifically. "Several species are seen here during spring and autumn on their migratory voyages. . . ." "A few come up to our harbour in stormy weather, but only for a day or two. . . ." The harbour of Glasgow, at the time of which Dr. Grieve writes, may not have presented the attraction of "fine confused feeding" that it does at present. The Black-headed Gull is abundant at all seasons now-a-days, while the Lesser Black-backed and Herring Gulls are summer and winter visitors respectively, and the Common Gull may be seen on a rare occasion.

Large flocks of Ducks were to be seen at Millburn towards the end of November, flying southwards, and returning north again

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about the beginning of February, but the species were not distinguished.

One puts aside this interesting work with feelings of regret. Written out at the age of twenty, and based on a journal kept between the author's sixteenth and eighteenth years, it is remarkable for the breadth of view attained. It is not usual to find naturalists at the age named already noting carefully all matters relating to seasonal movements, song-periods, autumn-songs, dates of nesting, and time occupied by different birds in incubation and nutrition, experiences gained in rearing wild birds in confinement, &c. And further, the work is quite individual in its character, as it does not appear that he had any associate on whom he could rely for assistance. The district to which it refers has been rudely shorn of its natural attractions in recent years, verily, "man marks the earth with ruin." The name persists certainly in Millburn Street, Millburn Public School, and Millburn Chemical Works, but that to the naturalist is a poor return for the furze and the sand quarry, the burn (now covered up), the currant bushes, and the walled pear tree where the Spotted Flycatcher nested. The house was demolished a year ago. It stood within the square now represented by Millburn, Holybank, Kilberry and Scarba Streets, with houses for the humblest class of worker. Elevation is indeed the only natural attraction left, and from the neighbourhood ample views are still obtainable.

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The Seals, Whales, and Dolphins of the Clyde Sea Area.

By HUGH BOYD WATT.

[Read 28th May, 1901.]

N.B.—The numbers within brackets refer to the list at the end of the paper.

The Clyde Sea Area includes all the tidal waters contained within a straight line drawn from the Mull of Kintyre to Loch Ryan. In respect of its marine mammals, it may be regarded as an almost land-locked and small portion of the region which Dr. P. L. Sclater calls Arctatlantis, and of which the characteristic genera are *Halichœrus*, *Cystophora*, and *Hyperoodon* (11). In "Clyde" and adjacent waters *Cystophora* is unrecorded, but the other two are represented.

A considerable advance can be claimed in our knowledge since 1876, when the late Mr. E. R. Alston could only name three species of marine mammals from Clyde waters (1), a number which was not added to in his subsequent paper published by this Society (2). The following annotated list shows that we now have definite records of eight species, and, in addition to these, there are four further species named within square brackets, as confirmation of their occurrence is awanting. This will be forthcoming in the course of time, I feel convinced. Other records, which I believe to be erroneous, I have excluded. One such is the Greenland Whale (*Balæna mysticetus*, Linn.) (12), whose occurrence in British waters at any time is not admitted. Here it may also be said that no fewer than eight species of Cetaceans are named from "Clyde" in the two "Statistical Accounts of Scotland" (1791-7 and 1845), but only those otherwise confirmed are given below.

Not infrequently newspaper reports of "Whales" appear, and while no scientific reliability can attach to these statements, yet they are evidence that Cetaceans are not so uncommon in our Firth as is generally supposed. Unlike land mammals, marine mammals have uninterrupted means of passing from one region

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of the globe to another, the sea serving to them as a great highway forming a continuous zone of communication, and not as a dividing barrier. Consequently our number of species of Cetaceans, in proportion to the whole number of species known, is probably larger than that of any other group of mammals in our fauna.

ORDER: *Carnivora.*
FAMILY: *Phocidae.*

1. *Halichœrus grypus* (Fabr.). Grey Seal.—I am indebted for what I know as to this species to Mr. Alexander Gray, Curator of the Millport Marine Biological Station. Its early occurrence is vouched for by a tooth which Mr. Gray found in a kitchen midden near Campbeltown, and which Dr. Joseph Anderson identified. Mr. Gray also has information that, up to about 1860, two grey seals were known to live, summer and winter, on Paterson's Rock, in the Sound of Sanda (6). They disappeared without any known reason.

When Mr. Gray was dredging off the Little Cumbrae, on 8th September, 1900, a grey seal rose leisurely to the surface within 30 yards from his boat. A good view was obtained of it, as it was seen three times altogether. Mr. Gray thinks it was three times the size of an ordinary seal, one of which he saw on the same day near the same place (5).

2. *Phoca vitulina*, Linn. Common Seal.—I have notes of the recent occurrence of this species all over our area from Sanda upwards. One was shot so far up as two miles above Port-Glasgow in 1890. Loch Fyne is apparently a breeding resort, and an old seal with two pups were seen near Largs in 1899. According to the new "Statistical Account" (V., 1845), a favourite haunt is a rock in the sea not far from Troon. This probably refers to the Lady Isle, which is still frequented. I was so fortunate as to see a herd of from 30 to 40 there in June, 1900. The probability is that this species is much more common than is generally supposed, although there is now no seal-fishing. This seems to have been pursued in "Clyde" about 1791 (13).

3. [*P. groelandica*, Fabr. Greenland or Harp Seal.—Mr. F. Gordon Pearcey informs me (*in lit.*, 30th October, 1899) that he

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saw in June, 1899, two seals, probably this species, close to his ship, when trawling between Pladda and the Ayrshire coast. He hit one with a revolver shot, but it sank shortly after.]

Observation.—*P. hispida*, Schreber. Ringed or Marbled Seal. —Professor Sir William Turner gives particulars of frequent finds of remains of this species in Scottish glacial clays, and although none are from the Clyde, they have probably been overlooked (17).

ORDER: *Cetacea.*
FAMILY: *Balænopteridae.*

4. [*Balænoptera musculus* (Linn.). Common Rorqual or Razorback.—Dr. John Walker, in his "Essays" (1808), states that this species yearly frequents Loch Fyne during the herring season, and this statement is repeated by other writers. No captures are however known. Mr. Gray tells me that about the year 1889 the Sound of Kilbrannan was frequented by a whale, 50 to 60 feet long, followed by two calves; the three were well known to the fishermen, and often seen by him. Mr. F. Gordon Pearcey also saw a whale, probably this species, 3½ miles south of Davaar Island, on 10th October, 1899.]

Observation.—A post-tertiary deposit near the mouth of the River Irvine bears the name of the Irvine Whale Beds (16). Cetacean remains have been found there from 1790 onwards. A skull, obtained in 1863, and another one and some ribs and vertebræ, obtained in 1889, are in the Hunterian Museum. A broken cranium, found in 1892, was at one time in the Anatomical Museum, Edinburgh University, but is now in the Museum at Kilmarnock. Sir William Turner thinks this belongs to a *Balænoptera*, but he cannot definitely state the species (*in lit.*, 17th July, 1900).

5. *B. rostrata*, Fabr. Lesser Rorqual or Pike Whale.—On 7th August, 1897, the small steam whaler "Thrasher," when on her trial trip, had the unusual experience, in such circumstances, of putting her whaling gear into actual use. She harpooned and killed a whale off Largs, and towed the carcase, which was about 30 feet long, up to Greenock. It was offered for sale at £5, and the lips found their way to Paisley Museum, where I saw them. Their resemblance to an illustration in Sir William

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Turner's article on the Lesser Rorqual (18) struck me, and on sending a photo. of them to Mr. Oldfield Thomas, of the British Museum, he stated that they seemed to belong to this species. This is the first and only record of it in Clyde waters (21), but it has occurred in Islay (3).

FAMILY: *Physeteridæ.*

6. *Hyperoodon rostratus*, Müller. Bottlenose.—This species is frequently reported, and is apparently not uncommon. Mr. Gray sees it every season off the Cumbrae shores. The old "Statistical Account" (1792), under Row, says:—"A species of whale, called Bottlenoses, have sometimes run aground during the ebb of tide, been taken, and oil extracted from them." In recent years I have the following definite records of its capture:—In 1863 one was taken in the Gareloch, and its cranium shown to this Society by Dr. Scouler (15); in October, 1883, a young male was stranded at Loch Ranza—the skull and some other bones are in the Anatomical Museum, Edinburgh University (19); in July, 1896, a small male was captured at Kingston Yard, Port-Glasgow (9); in January, 1898, one came ashore at Peaton, Loch Long—I found the carcase entombed in a lime-heap when I went to see it; and in September, 1899, I was more fortunate in seeing one which had stranded on the beach at the North Shore, Ayr (21). Without placing any weight on reports of this species having been merely seen, the foregoing is evidence that such reports may not be inaccurate.

FAMILY: *Delphinidæ.*

7. *Phocæna communis*, Less. Common Porpoise.—This is our commonest Cetacean, and may be seen at all seasons of the year. One hundred years ago it came as far up the Clyde as the Broomielaw (14), and it still may be seen off Greenock. The mouths of Loch Long and the Holy Loch are favourite haunts, and I have notes of it from many places in our waters. Last month a small school of about half-a-dozen was playing at the head of Loch Long, and several times I saw leaps taken clean out of the water in the manner of the "Bucker" (Dolphin). When a school is playing, the individuals seem often actually to rub along, side touching side; thus, from some points of view, two dorsal

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fins may have the appearance of belonging to one animal, and may cause bewilderment. Porpoises sometimes approach very close to the shore, apparently in the most confident manner. Last month I saw one moving slowly along shore at Kirn, only two or three yards from the beach. In August, 1825, a pure white porpoise was shot off Millport and brought ashore (8). I do not remember hearing of a white porpoise elsewhere.

8. [*Orca gladiator*, Gray. Killer or Grampus.—There seems little doubt but that this species has occurred in our waters, but as no capture is on record, it is here given within square brackets. Both the "Statistical Accounts" include it—the new one speaking of "the depredations of the porpus, grampus, and other destructive sea-fishes, particularly the grampus, which comes up nearly as far as the salt water reaches almost every tide at flood during certain seasons in pursuit of salmon, of which it devours great numbers."

Mr. Gray says that he knows it, *e.g.*, as occurring on the Ballantrae Banks in spring; and Mr. John Paterson saw two off Bute in June, 1898 (10). The old "Statistical Account" calls it the "Bucker," and as the name Grampus is given to the Pilot Whale by fishermen, there cannot but be uncertainty as to the correct species when a "Grampus" is heard of. It seems not unlikely that the Kilbrannan Sound "sea-serpent" story of the summer of 1899 may be founded on the appearance of an individual or individuals of this savage species.]

9. *Lagenorhynchus albirostris*, Gray. White-beaked Dolphin. —Next to the porpoise, this seems to be our commonest Cetacean, although it is only in recent years that it has been conclusively added to our Scottish fauna. The first authentic record in Scottish waters is that of an individual shot in Kilbrannan Sound in September, 1879, by Mr. J. Y. Buchanan. The skull is in the Anatomical Museum, Edinburgh Museum. Sir William Turner saw in these waters in August, 1887, what he believed to be a school of the White-beaked Dolphin (20).

The late Dr. James Dunlop said that they are to be seen daily in Kilbrannan Sound, and the four specimens (a stuffed example and three skeletons, one a fœtus) which were in the Kelvingrove Museum, were all captured in the Sound in 1894 and 1895 (4), and presented by Dr. Dunlop to the Museum. In November,

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1899, Mr. John Robertson found cast up on the beach near St. Ninian's Bay, Bute, the carcase of a small Cetacean, the skull and sternum of which were subsequently recovered and sent to me. I made the species to be the one under discussion, an identification which was very kindly confirmed by Sir William Turner, with whom the skull was left to be placed in the Anatomical Museum, Edinburgh University (22). These occurrences seem to indicate that the animal so well known in the Firth of Clyde as the "Bucker," and in Loch Fyne as the "Stinker," is identical with this species. Fishermen and yachtsmen clearly distinguish it from the porpoise by its larger size, and by its conspicuous habit of leaping out of the water. By the Loch Fyne men this is said to be the "stinkers threshing." They make themselves a nuisance to the herring fishermen by following the boats, so much so that the men throw ballast stones at them to drive them away, not because of any danger, but because in coming to the surface the Dolphin causes such a glare of phosphorescence as to dazzle the eyesight. If one becomes entangled in the nets, it can leap out of, or over them, and escape. The leaping is frequently done in broad daylight, and I have seen a school of about a dozen in the shallow waters of Whiting Bay, playing and gambolling round the ferry-boat, throwing themselves well clear of the water and falling back with a resounding splash—a fine sight in the bright sunshine of a summer day (August, 1897). Seen at a distance, their bodies are in a beautiful curve when clear of the water, not unlike salmon leaping. They seem to possess a power of suspended motion, and sometimes bring their rapid actions suddenly under control, leaving their caudal extremities projecting above the surface for a short time before drawing them under. The impression given is that the animal stands on its head, as it were.

Other species of Dolphin have occurred in our waters, and the name "bucker" may apply to them all, but, so far as I know, the only statements with any specific value regarding our other Clyde Dolphins are the following:—

10. *L. acutus*, Gray. White-sided Dolphin.—An example of this rare British species is stated to have been seen lying on the pier, at Ardrishaig, by the Rev. N. Macpherson, of Newton, Inveraray (7). It would confirm the identification were it known that the skull had been examined by a competent authority.

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11. [*Delphinus delphis*, Linn. Common Dolphin.—Mr. Pearcey informs me that in September, 1898, he saw a large school of what he took to be this species, between Ardlamont and Skipness Points. There is in Rothesay Museum a skull labelled "Porpoise, from Mr. A. M'Kirdy," which I believe to be this species, as the skull is about 24 inches in length and has about 190 teeth. It is certainly not the Common Porpoise.]

12. *Tursiops tursio*, Fabr. Common Tursio.—According to the new "Statistical Account" (1845), the Great Dolphin (*D. tursio*), from 12 to 15 feet in length and with a pointed muzzle or beak, frequents the coast of Saddell and Skipness during the herring-fishing season. There is more satisfactory evidence than this of the occurrence of this species in our waters, as Dr. D. Noel Paton shot one in August, 1879, in Loch Long, the skull and ear-bones of which are in the Anatomical Museum, Edinburgh University (22).

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Meteorological Notes, and Remarks upon the Weather during the Year 1900, with its General Effects upon Vegetation.

By JAMES WHITTON, Superintendent of Parks, Glasgow.

[Read 28th May, 1901.]

THESE notes are compiled, as in former years, from observations taken at Queen's Park, Glasgow, so that the continuity of the series is preserved.

January.—The cold frosty weather experienced towards the close of 1899 gave place at the opening of the year to mild and moist weather, and this was the general nature of the atmospheric conditions throughout the entire month. During the first week the weather was bright and pleasant, though with occasional showers of rain. On the 9th showers of sleet fell, followed by a period of showery and dull days. On the 19th the weather became boisterous, and throughout the day fitful gusts of wind and rain swept the streets. On the following day the wind increased, with rain, hail, and sleet at intervals, and continued until the 26th, when there was a slight thunderstorm. On the

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27th and 28th slight showers of snow fell in the early morning, and the atmosphere became somewhat colder.

The barometer readings show a very irregular pressure throughout the month, with some sharp changes. From the 3rd the tendency was upwards, till on the 11th it read 30·10 inches, the highest reading of the month. During the succeeding three days it fell rapidly to 28·96 inches on the 15th; the pressure thereafter till the close of the month was steady.

Frost was registered on five mornings to the amount of 12°, while the total for the same month of the previous year was 94° for twelve days. The average maximum temperature for the month was 43° and the average minimum 35°, as against 40° and 32° respectively for January, 1899.

The amount of rain registered during the month was somewhat heavy, being 5·08 inches, part of which, however, was melted snow.

Owing to the comparative immunity from frost during the month, the grass was still green at the close. *Jasminium nudiflorum* was in full bloom, and narcissi were to be seen above the surface in open borders.

February.—With the advent of this month the weather conditions abruptly changed, and keen frosty weather set in. From the opening of the month till the 11th the frost increased in strength, and on the morning of that day the thermometer at Queen's Park registered 9°, or 23° of frost. Skating and curling were freely indulged in on all the ponds around the city, and the air was keen and bracing. On the 9th and 10th there were heavy falls of snow to a depth of six inches, and, unlike the usual experience in the city, it continued to lie on the ground till the 15th, when, after a further fall of snow, followed by rain, it rapidly disappeared. On the 22nd, after a succession of milder days, a heavy snowfall was again experienced. Thaw set in immediately after, and the closing days of the month were cold and wet.

The range of the barometer during the month was low, the highest reading being 29·75 inches, and twice it fell to 28·40 inches, viz., on 16th and 19th.

The total amount of frost registered was 189° for nineteen days, and on five days the thermometer did not rise above freezing

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point (32°). The average maximum and minimum temperatures were 38° and 26° respectively. In 1899 these figures were 43° and 32° respectively.

The rainfall of the month was 2·68 inches, and included a quantity of melted snow. There were 20 dry days.

The sharp frosts experienced during the month checked precocious vegetation, and had a most damaging effect upon those shrubs which made late growth, or whose tissues were surcharged with sap, consequent on the mild wet weather which prevailed during the greater part of the four preceding months. Such plants as *Aucuba japonica*, certain forms of *Rhododendron ponticum*, and the common laurel suffered severe injury in the young shoots. The foliage of the laurel especially, was browned to a greater degree than usual in the western and northern parks. In the case of *Olearia Haasti*, which, by the way, we find to be an excellent town plant, in several parks it was hardly injured, whilst in others it was killed to the ground.

March.—As in the previous month, the weather in March continued cold and frosty, with a period of fine clear days.

The opening days were bright and springlike, but on the 19th the atmosphere became colder, and snow fell to a depth of 2 inches. Thereafter the weather remained cold and dull, with a recurrence of snow on the 27th and 28th.

The atmospheric pressure was regular for the first fortnight, but on the 14th the barometer fell sharply from 30·38 inches to 29·10 inches on the 19th, the day on which the snowfall occurred. From this point it gradually rose until it reached 30·05 inches on the 31st.

The rainfall recorded this month was very moderate—the amount measured (0·28 inch) being little more than a quarter of an inch. There were 27 dry days during the month.

Frost to the extent of 83° was recorded for twenty days, and the lowest thermometer was 22° (10° of frost) on the 18th. For the same month of 1899 there were 72° of frost for nine days. The average maximum temperature for the month was 44° and the average minimum 31°, against 46° and 35° respectively for the corresponding month of last year.

Vegetation was held in check by the cold and frosty winds

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prevailing during the month, but towards the close, with a warmer sun, buds began to swell and the grass to make some growth. Snowdrops were in full bloom about the middle of the month, and towards the end crocuses came into flower.

April.—This month was bright and sunny, though there was a prevalence of cold winds and considerable rain. From the 18th to the 25th the days were bright and sunny. There was a comparative absence of frost throughout the month, only 14° being recorded for six mornings, and the average maximum temperature was 55° and the average minimum 38°, as compared with 52° and 37° respectively for the preceding April.

The barometric record for the month was wide and erratic, ranging from 28·90 inches to 30·25 inches.

The rainfall was 2·14 inches, and there were 16 dry days.

Owing to the cold winds of the month vegetation did not make great progress, and trees and shrubs put forth their leaves but slowly. Grass, however, made some growth, stimulated by the frequent showers and spells of sunshine. Hyacinths and narcissi were in full bloom by the 26th, making a very good appearance, though the latter were not quite so floriferous as in the preceding year. The lateness in blooming of that early variety of hybrid rhododendron "Eugenie" indicated the tardiness of growth. Frequently it is in full bloom by the end of April, whereas this year it was past the middle of the month ere it began to open its flowers.

May.—The month opened well with two fine days, when the atmosphere was dry and warm, but on the 3rd and 4th the wind increased to a gale, and the weather became damp and raw. Till the 9th the atmospheric conditions continued dull and showery, but on this day the wind, which had been mainly from the south-west, changed to the east, and a period of dry and cold days were experienced. On the 18th the wind again turned to the south-west, and was followed by warmer and more seasonable weather, which lasted till the close of the month.

The barometric readings ranged, with no particularly rapid change, from 30·00 inches on the 13th to 29·10 inches on the 22nd, and the rainfall of the month was 2·19, with 17 dry days.

Frost was registered this month on one morning, 2° being

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recorded on the 13th. The thermometer readings show that the temperature was on no occasion very high, the highest reading being 66° on the 27th. On nine occasions the thermometer fell below 40°, and the average maximum was 58° and the average minimum 42°.

Notwithstanding the cold winds of the middle of the month, vegetation made satisfactory progress, and trees and shrubs were in better foliage than has been the case for several years. With the comparative freedom from frost, flowering trees and shrubs, such as laburnum, lilac, and cherry, bloomed exceedingly well, and made a brilliant display—the notable exception being rhododendrons, which generally bore a light load of flower. The ash leafed on the 18th, and the oak on the 24th, both some days later than usual, and in reversed order to what usually occurs, and, as the sequel proved in our district, not in accordance with the old "saw," which gives a dry season when the ash leafs first. The notes of the cuckoo were first heard on the 7th.

June.—The bright warm days of the close of May continued through the first week of June, though on the 7th the weather became dull and unsettled. Saturday, the 9th—the "Children's Day" in the Parks of Glasgow—was dull and wet in the morning, but, fortunately, broke up fine, enabling the youngsters to enjoy their fête under fairly comfortable conditions. On the evening of the 12th, after two or three sultry days, a sharp thunderstorm was experienced. From the 14th there was a spell of fine warm days, and on the 22nd there was a recurrence of the thunder, and the weather was changeable and showery. On the 25th the total rainfall recorded for the preceding twenty-four hours was 1·42 inches, and the total rain for the month was 4·04 inches, there being 13 dry days.

The atmospheric pressure during the month was very steady, varying little between 30·20 inches on the 1st to 29·30 inches on the 30th.

The highest reading of the thermometer in the shade was 74°, which was recorded on the 11th and 12th, and on other five occasions the thermometer was at or above 70°. The averages for the month were—maximum 65° and minimum 49°, while in 1899 these were 69° and 50° respectively.

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The genial warmth and frequent showers of the month gave an impetus to vegetation, and there was a strong growth on trees and shrubs, as well as a superabundance on grass lawns. Newly-planted stuff made an excellent start and rapid progress, whilst there was a development and freshness of foliage on the trees in our City Parks above the usual average. The hawthorns came into bloom during the first week, but they, like the rhododendrons, were much below the average in floriferousness.

July.—The first days of the month were somewhat dull and changeable, and on the 3rd rain, accompanied by thunder, was experienced. For the succeeding fortnight the weather was more settled, but with occasional showers. On the 12th the weather was again broken, and the outlook for the holiday-makers was not particularly bright. With a heavy rainfall on the night of the 16th the atmospheric conditions improved, and continued generally fine till the close.

The rainfall of the month (3·03 inches) was moderate, and there were 11 dry days.

The thermometer in the shade was at or above 70° on nine occasions, and the average maximum and minimum temperatures were 67° and 54° respectively, while in 1899 these figures were 68° and 53°.

On the 1st the barometer indicated the atmospheric pressure at 29·20 inches, being the lowest of the month; for the succeeding few days it rose sharply, and on the 7th and 8th the reading was 30·00 inches, and continued steady at about 29·80 inches through the rest of the month.

With a fair amount of moisture during the month vegetation made good progress, though bedding plants, owing to the want of bright sunshine, did not make so good a show of bloom as formerly, but the foliage on plants and trees bore a fine dark, green appearance.

August.—August opened with a day of rain and strong wind, and the first week of the month was showery. On the 6th rain fell in torrents, and a thunderstorm passed over the city. The amount of rain registered for these twenty-four hours was 1·17 inches. On the 13th the thermometer began to rise considerably,

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and there followed a number of days of bright and warm weather. On the 19th the weather again became showery, and on the 23rd some hail showers fell. The closing days of the month were dry but cold, with a prevailing east wind.

The atmospheric pressure during the month was rather lower than the average. Only on two occasions did it rise above 30·00 inches—once about the middle and once at the end of the month—the lowest readings being 29·20 inches, happening on the 7th and on the 22nd. The direction of the wind varied a good deal, but on 10 days it blew from the east.

With the exception of one or two days during the month, when the thermometer rose above 70°, the temperature was moderate. The maximum thermometer in shade was at or above 70° on 5 occasions, and at or below 60° on 12 occasions. The average temperatures were lower than the preceding August by 7° and 3° respectively, the figures for 1900 being—maximum 62° and minimum 50°.

The rainfall of the month was 4·36 inches, and there were 16 dry days.

The moist weather of the month tended to keep vegetation fresh and bright, though for want of sunshine flowering plants did not come up to the usual standard.

September.—Throughout this month the weather was of a pleasanter character than that of the previous month. The wind, except on one day, was from the south-west, and, though strong at times, was mild and refreshing, and there were longer periods of dry weather. The rainfall registered at Queen's Park was 3·70 inches, and there were 18 dry days. On two days of the month over half an inch of rain fell, namely, 0·84 inch on the 27th, and 0·70 inch on the 30th.

The barometer readings show a higher range than usual. During the first half of the month the pressure varied between 29·75 inches and 30·30 inches; for the second half the range was lower, from 30·00 inches on the 21st to 29·00 inches on the 27th.

The average temperatures for the month were—maximum 61° and minimum 47°, and higher than in 1899, which for the same month were 59° and 46° respectively.

The fine weather of the first part of the month improved the

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flower beds in the parks, and the effect was bright and pleasing. Dahlias and chrysanthemums were in full bloom by the middle of the month, and many deciduous trees rapidly became divested of their leaves, especially elms, limes, and sycamores.

October.—For the first fortnight the weather was very rainy and unsettled, with, as a rule, fine dry forenoons, which usually gave way in the afternoons to rain or hail. The temperature during this period was high considering the season, but on the 15th the atmosphere became much colder, and for two days the weather was bright and frosty, with a keen snell wind, which suggested the approach of winter. On the 17th a sudden change again took place in the atmospheric conditions, when the barometer fell sharply, and heavy rain came down. During the forenoon of this day a dense blackness overspread the city. Throughout the later part of the month the weather was brighter, though there were few dry days.

The pressure of the atmosphere as shown by the barometer was moderate and comparatively steady till the 17th, when it rose from 29·40 inches to 30·00 inches on the 19th, and for five days the readings were above 30·00 inches. On the 24th the pressure decreased, and on the 26th the reading was 29·00 inches.

For the month the rainfall amounted to 5·05 inches, and there were only ten days on which rain was not recorded.

Frost to the extent of 5° was registered on one morning, and on one other occasion only did the thermometer fall to freezing point (32°). The average maximum temperature was 51° and the average minimum 40°, the maximum being 3° lower and the minimum the same as in the corresponding month of last year.

The sharp touch of frost experienced on the 16th was sufficient to bring to a close for the season most of the outside flowers, Chrysanthemums alone withstanding the cold, and at the end of the month were still giving a little brightness to the flower beds. The grass was also green and fresh, though most of the deciduous trees had divested themselves of foliage.

November.—This was a month of mild and wet weather. For the first 17 days only two days were dry, and the amount of rain which had fallen during that time measured over 5 inches

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On the 18th the thermometer fell considerably, and 4° of frost was registered at Queen's Park on that morning. On the next day the frost increased, and was accompanied by a black dismal fog, which hung over the city for two days. The spell of frost broke up on the 23rd, and the atmospheric conditions again became mild and wet.

Throughout the month there were only 9 dry days, and the amount of the rain which had fallen measured 6·20 inches.

The range of the barometer was wide, and had some sharp changes. On the 2nd it was at 29·90 inches, from which it fell steadily to 29·10 inches on the 7th. From 28·90 inches on the 15th it rose sharply to 30·20 inches on the 18th and 19th, and falling again to 29·10 inches on the 25th.

Frost to the amount of 21° was registered on five mornings. The average maximum temperature was 46° and the average minimum 38°, as against 49° and 40° respectively for the corresponding month of last year.

December.—The protracted spell of wet weather prevailing last month continued throughout December, and on only three days out of the 31 was no rain recorded. Until the 7th the weather conditions were dull and depressing, but on this date the weather improved a little, being dry and mild. On the 8th rain again prevailed, and was accompanied by a strong wind from the south-west. These atmospheric conditions obtained till the 20th, when the wind greatly increased in force, and a severe gale raged for several hours between the 20th and the 21st, the worst experienced in this part of the country for a number of years, causing much damage to property, and considerable loss of life in the city and throughout the country. Christmas day was dull and damp, and the closing days of the year were likewise dull and unseasonably mild.

The rainfall for the month amounted to 7·71 inches, and is the greatest monthly total since February of 1894, when the total for that month was 8·96 inches.

As showing the unseasonable mildness of the month, no frost was recorded at Queen's Park, and the thermometer fell to freezing point (32°) on only one occasion. The average maximum and minimum temperatures of the month were 47° and 40° respectively, while these for December 1899 were 39° and 30°.

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For the first three weeks of the month the barometer readings show no especially sharp changes, but on the 21st, the day of the great gale, the atmospheric pressure was indicated at 28·90 inches. On the 28th it dropped from 29·20 inches to 28·50 inches on the 29th, this being the lowest reading of the year.

The effect of the abnormal mildness was seen by the condition of the grass, which was bright and green. The buds on some forms of hawthorns swelled nearly to bursting, and roses made fresh growth; the Japanese species, *Rosa rugosa*, being as precocious as any of its congeners. *Jasminum nudiflorum*, which began to open its blooms during November, was in many cases in fine flower during the month.

With regard to the rainfall of 1900, it may be noted that the total amount registered for the year, 46·46 inches, is greatly in excess of the yearly records for the last twelve years. The next highest yearly record is that of 1899, when 41·67 inches were registered. The number of dry days during the year was 164, while in 1899 there were 193 dry days, and the lowest for the twelve preceding years was in 1890, which had 170 dry days. A striking contrast, and as showing the period during which the rainfall of 1900 exceeded that of the preceding year, is the total for the last three months of the year. The amount registered in 1899 for this period was 12·15 inches, and for the same period of 1900, 18·96 inches. The heaviest rainfall for one day in 1900 was 1·42 inches on the 25th of June, while in 1899 the heaviest daily rainfall was 1·50 inches on the 18th of May. The wettest month of the year was December, with a total of 7·71 inches. In the preceding year the wettest month was also December, which had 5·64 inches. The driest month of 1900 was March, with the month of 1899 with total of 0·28 inch, August being the driest exceptionally small 1·38 inches.

As already stated, these notes are based on records taken at Queen's Park, but the following table of the rainfall recorded in the other Parks, &c., where gauges have been placed, show interesting points of comparison; due allowance being made for the altitude, exposure, and other local conditions, as in no case are they alike:—

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RAINFALL DURING 1900 IN THE PUBLIC PARKS.

	Queen's.	Maxwell.	Kelvingrove.	Springburn.	Alexandra.	Glasgow Green.	Bellahouston.	Tollcross.	George Square.
Height of Gauge above Sea-level.	145 ft.	69·1 ft.	48·3 ft.	361 ft.	141·4ft.	34·7 ft.	160 ft.	85 ft.	40 ft.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
January, -	5·08	5·34	4·52	4·47	4·56	4·94	4·25	5·54	4·63
February, -	2·68	1·72	2·95	2·28	2·90	2·86	2·60	2·48	2·63
March, - -	0·28	0·28	0·51	0·42	0·65	0·63	0·30	0·57	0·49
April, - -	2·14	2·27	2·08	2·27	1·68	1·88	1·95	2·02	1·78
May, - - -	2·19	2·20	2·11	2·02	1·97	2·25	2·07	2·34	2·05
June, - - -	4·04	3·88	2·75	3·32	3·67	3·76	3·48	4·30	3·26
July, - - -	3·03	3·05	2·87	2·69	3·16	3·30	3·01	3·54	3·32
August, - -	4·36	4·37	4·75	3·99	4·02	5·33	4·21	4·59	4·85
September, -	3·70	3·70	3·50	3·69	3·05	3·37	3·61	3·26	3·59
October, - -	5·05	4·80	4·92	4·86	4·42	4·57	4·74	4·92	4·75
November, -	6·20	6·23	5·70	5·56	5·67	6·35	6·02	6·46	6·53
December, -	7·71	8·03	7·18	6·50	5·97	7·05	6·43	7·26	7·42
Totals, -	46·46	45·87	43·84	42·07	41·72	46·29	42·67	47·28	45·30

In reference to the temperature, the mean (47°) is the same as that of the preceding year. Although the amount of frost for the year is considerably less than that of 1899, the absence of any prolonged period of heat during the summer goes to make up the balance. The highest reading of the thermometer in the shade was 75° on the 15th of August, which is 5° lower than the highest reading of 1899. The thermometer was at or above 70° 7 days in June, 9 in July, 5 in August, or 21 times in all, as compared with 35 times in 1899.

The lowest reading of the thermometer was on the 11th February, when the minimum thermometer fell to 9°, or 23° of frost. The amount of frost registered throughout the year was 326°, occurring on 57 days, and the coldest month was February, with 189° of frost registered on 19 mornings. In 1899 December was the coldest month, and the total amount of frost for the year was 415 on 64 mornings. The coldest day was 15th December, when the thermometer touched 15°-17° of frost.

The following comparative table of records taken at different Parks, &c., is of interest. As in the case of the preceding table allowance must be made for local conditions:—

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1900.	Queen's Park.	Maxwell Park.	Kelvingrove Park.	Springburn Park.	Alexandra Park.	Glasgow Green.	Bellahouston Park.	Tollcross Park.	George Square.
Thermometer (in shade, 4 feet above ground level).									
Highest reading of year, ...	75°, 15th Aug.	87°, 17th July	81°, 15th Aug.	83°, 16th Aug.	77°, 16th and 17th Aug.	85°, 11th July	78°, 11th June, 20th July, and 17th Aug.	82°, 16th Aug.	80°, 16th Aug.
Lowest do. do.,	9°, 11th Feb.	3° below zero, 10th, 11th and 12th Feb.	10°, 11th Feb.	7°, 12th Feb.	4°, 11th Feb.	3°, 11th Feb.	9°, 12th Feb.	3°, 11th Feb.	18°, 12th Feb.
Number of days on which thermometer fell to freezing point (32°), ...	64 days	140 days	58 days	84 days	116 days	122 days	72 days	95 days	43 days
Number of days on which thermometer did not rise above freezing point (32°),	5 days	11 days	5 days	4 days	7 days	9 days	5 days	5 days	4 days
Degrees of Frost registered—									
January, ...	12° on 5 days	90° on 21 days	16° on 6 days	10° on 6 days	79° on 19 days	84° on 21 days	24° on 11 days	41° on 14 days	...
February, ...	189 " 19 "	320 " 22 "	147 " 16 "	191 " 18 "	257 " 24 "	298 " 24 "	181 " 19 "	247 " 18 "	92° on 15 days
March, ...	83 " 20 "	181 " 25 "	64 " 16 "	118 " 19 "	148 " 23 "	162 " 24 "	84 " 19 "	104 " 22 "	34 " 13 "
April, ...	14 " 6 "	62 " 10 "	8 " 4 "	20 " 6 "	47 " 9 "	42 " 9 "	13 " 5 "	28 " 8 "	...
May, ...	2 " 1 day	16 " 3 "	...	...	10 " 4 "	2 " 2 "	...	6 " 2 "	...
June, ...	...	...	...	...	...	...	...	...	...
July, ...	...	...	...	...	...	...	...	...	...
August, ...	...	...	...	...	...	...	...	...	...
September, ...	...	4° on 1 day	...	...	...	1° on 1 day	...	1° on 1 day	...
October, ...	5° on 1 day	58 " 13 days	2° on 1 day	17° on 5 days	22° on 7 days	25 " 9 days	10° on 2 days	16 " 6 days	...
November, ...	21 " 5 days	75 " 11 "	14 " 4 days	42 " 8 "	47 " 9 "	54 " 10 "	25 " 6 "	37 " 8 "	2° on 1 day
December, ...	...	23 " 7 "	...	4 " 2 "	6 " 1 day	9 " 6 "	1 " 1 day	4 " 2 "	...
Total Frost registered,	326° on 57 days	829° on 113 days	251° on 47 days	402° on 64 days	616° on 96 days	677° on 106 days	338° on 63 days	484° on 81 days	128° on 29 days

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In comparing the barometer records with those of the previous year we find that the atmospheric pressure generally has been lower than that of previous years. In 1899 the pressure was over 30·00 inches on 82 days, and under 29·00 inches on 24 days, whilst during 1900 it was only 50 days above 30·00 inches and 8 days below 29·00 inches. The highest reading taken during 1900 was 30·38 inches on the 14th March, and the lowest (28·40 inches) was taken on the 19th February. In 1899 the highest was 30·42 inches on 17th November, and the lowest (28·26) on 30th December.

The points from which the wind blew throughout the year were as follows:—From the south-west, 258; from the north-east, 30; from the west, 17; from the east, 6; from the south, 3; from the north-west, 15; and from the south-east, 36 days. Excluding the direct north and south, the western group shows 290 and the eastern 72 days. In 1899 the western had 255, and the eastern 102 days.

In reviewing the weather of 1900 many interesting features are witnessed. It began as it ended—unseasonably mild and moist. January was very changeable and unsettled, with a preponderance of high temperatures. February and March, on the other hand, were distinctly cold months. Since the break up of this cold spell, and with the exception of some cold days in May, there was no unpleasant reduction of temperature. As early as April there were some very warm days, but perhaps the most notable feature of the weather of 1900 was the abnormal rainfall, especially during the last three months of the year.

In regard to the general effect on vegetation, speaking broadly, the atmospheric conditions which obtained during 1900 were, on the whole, favourable.

After the sharp frosts in February, which rudely checked the unseasonable advance made by certain deciduous plants and seriously damaged many classes of evergreens, there was an absence of severe late spring frosts, consequently the growth, though somewhat slow and late, was satisfactory. In many cases the development of shoot and leaf was better than it has been for a series of years. The paucity of bloom displayed by evergreens can be accounted for by the abnormal mildness and excessive wetness of the late autumn months, which induced a tendency to

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secondary growth, which is fatal to the satisfactory setting of flower buds. In the case of rhododendrons the amount of arrested or imperfect development of flower buds was very marked. In regard to deciduous plants there was more diversity and irregularity than usual. Why there should be a prodigality of bloom on most of the prunus, laburnums, cherries, and wiegelas, and such a meagre display on most forms of pyrus, chestnut, lilacs, and hawthorns, is one of those features which are decidedly puzzling to those who attempt to correlate the cause and effect of weather on vegetation. That the conditions generally were of an unsatisfactory nature was evidenced by the irregular and meagre crops which were borne by most forms of deciduous trees, as even those which bore a fine display of bloom did not by any means set and carry heavy crops of fruit. In regard to annual vegetation, while cereals were an average in straw and grain, great difficulty was experienced in harvesting these in a satisfactory state, owing to the continuance of inclement weather. Turnips improved towards the end of the season, and the crops were better than was at first anticipated. The dearth of sunshine, combined with the excessive rainfall, seriously affected the potato crop, which was below average in quantity and quality, while in some cases, when planted late on heavy soils, the crop was not worth lifting. There was a superabundance of grass throughout the season, and pasturage at the end of the year was unusually fresh and green.

Regarding the prospects for the coming year, deciduous trees generally are in good condition, and, given congenial weather, there is every prospect of an excellent display of bloom. It is different, however, with most evergreens, which, owing to the superabundance of moisture and abnormally mild weather, are surcharged with sap, and ill-fitted to withstand a serious lowering of temperature, or a long spell of dry, cutting winds. It is to be hoped they will escape the ordeal they passed through in the spring of 1900, which, though of short duration, left them sadly crippled. The difficulty in getting evergreen shrubs to thrive in our city yearly increases; therefore, when the vitality of the plants is lowered by such natural accidents as severe frosts, there is small chance of them regaining vigour where the conditions, such as obtain in a busy, manufacturing centre, are decidedly unnatural,

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and when coupled with a heavy clay soil, through which water percolates slowly, certainly unfavourable for quick, healthy development, and ability to withstand severe and abnormal atmospheric changes.

Subjoined is the meteorological record for the past three years as kept at Queen's Park, and the averages for the last twelve years.

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COPY OF METEOROLOGICAL RECORD KEPT AT QUEEN'S PARK, GLASGOW.

Rain Gauge 145 Feet above Sea Level.

Months.	1898. Rainfall. Inches.	1898. Thermometer. Average. Max.	1898. Thermometer. Average. Min.	1898. Dry Days.	1899. Rainfall. Inches.	1899. Thermometer. Average. Max.	1899. Thermometer. Average. Min.	1899. Dry Days.	1900. Rainfall. Inches.	1900. Thermometer. Average. Max.	1900. Thermometer. Average. Min.	1900. Dry Days.	Averages for the Last 12 Years. Years.	Rainfall. Inches.	Mean Temperature.	Dry Days.	Number of Days on which 1° or more of Frost was registered.	Degrees of Frost registered.
January,	2·42	47	39	18	5·61	40	32	13	5·08	43	35	4	1889	26·18	47	194	59	250
February,	3·52	44	32	11	1·84	43	32	20	2·68	38	26	20	1890	38·04	47	170	74	273
March, ...	1·65	46	34	19	3·18	46	35	21	0·28	44	31	27	1891	36·09	46	184	85	371
April, ...	1·65	55	41	21	4·11	52	37	14	2·14	55	38	16	1892	33·84	45	194	101	798
May, ...	2·04	58	40	22	4·45	54	40	18	2·19	58	42	17	1893	33·05	47	186	56	306
June, ...	1·98	64	48	18	1·55	69	50	22	4·04	65	49	13	1894	41·48	46	169	55	256
July, ...	1·46	67	49	24	3·69	68	53	16	3·03	67	54	11	1895	27·57	45	202	99	823
August,...	4·77	65	51	15	1·38	69	53	23	4·36	62	50	16	1896	33·90	47	209	63	331
September,	3·99	63	48	15	3·71	59	46	5	3·70	61	47	18	1897	40·22	46	205	61	347
October,	3·97	54	46	20	3·57	54	40	15	5·05	51	40	10	1898	38·44	48	212	42	190
November,	4·67	46	37	18	5·64	51	42	10	6·20	46	38	9	1899	41·67	47	193	64	415
December,	6·32	48	40	11	2·94	39	30	16	7·71	47	41	3	1900	46·46	47	164	57	326
	38·44			212	41·67			193	46·46			164	Averages.	36·41	46°	190	68	390°

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Additions to the List of Scottish Coleoptera.

By ANDERSON FERGUSSON.

[Read 25th June, 1901.]

IN compiling the list of Coleoptera of Clyde for the Handbook to be issued on the occasion of the meeting of the British Association at Glasgow in September, I found in the material which passed through my hands a number of species which appeared to be new to Scotland. These species are included in the list of Clyde Coleoptera, but I have thought it advisable to put them on record separately, and accordingly I append a list of them hereto. Strictly speaking all the species in the appended list are not new to Scotland, as some of them were recorded previous to the publication of Dr. Sharp's "Coleoptera of Scotland" (*Scottish Naturalist*, 1871-81); but Dr. Sharp evidently was doubtful of the authenticity of these previous records, and the species to which they referred were either excluded from his list altogether, or only included within square brackets as requiring confirmation. Their occurrence in the Clyde area now confirms these doubtful records and gives the species a secure place on the Scottish list. So far as I can ascertain none of the beetles in the following list have been recorded from Scotland since the completion of Dr. Sharp's list.

I am indebted to the gentlemen whose names are mentioned below for permission to record their captures.

I have to thank the Rev. Alfred Thornley, F.L.S., the Rev. H. S. Gorham, F.Z.S., and Mr. G. C. Champion, F.Z.S., for their kindness in confirming my identification of some of the following species and identifying others for me.

The nomenclature followed is that of Sharp and Fowler's "Catalogue of British Coleoptera," 1893.

Leistus spinibarbis, F.—I have received a specimen of this fine species from Mr. John Dunsmore, of Paisley, and there is another in the collection of Mr. Robert Eden, of the same city. Mr. Dunsmore and Mr. Eden inform me that they take it sparingly in a wood near Paisley.

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Badister sodalis, Duft.—In Wilson and Duncan's "Entomologia Edinensis" (1834) this species is stated to have been taken by Dr. Leach at Loch Awe. This record is repeated in Murray's "Catalogue of the Coleoptera of Scotland" (1853). Dr. Sharp, however, in his list placed the species within square brackets, and remarked, "Doubtful as Scottish. 'Loch Awe, Dr. Leach' (Ent. Edin.). I am nearly certain this is an error." A single specimen (which has been shown to the Rev. Mr. Thornley) was taken by Mr. Andrew Adie Dalglish, F.E.S., by shaking moss near Barr, South Ayrshire, in April, 1900. Although Mr. Dalglish and I searched the locality thoroughly we could not find any further specimens.

Bembidium affine, Steph.—Although this pretty species was recorded as occurring near Glasgow in 1860, by A. and M. Soloman (*Entomologist's Weekly Intelligencer*, ix., 52), it was not included in Dr. Sharp's list. It had even earlier than this, in 1858 and 1859, been taken in the Glasgow district by the Rev. J. E. Somerville, B.D., F.S.A.Scot. More recently Mr. Dalglish has taken it sparingly at Giffnock and Mr. Dunsmore near Paisley.

Cercyon depressus, Steph.—A single specimen of this species was taken by Mr. Dalglish under decaying seaweed on the shore at Barassie, in June, 1899. The specimen has been submitted to the Rev. Mr. Thornley and Mr. Champion.

Gyrophæna pulchella, Heer.—At an excursion of the Society to Drymen, in September, 1900, I took several examples of this rare *Gyrophæna* in a decaying fungus in the policies of Buchanan Castle. Canon Fowler ("Coleoptera of the British Islands," ii., 155) states that "the species was first introduced as British by Dr. Power, and has only occurred in the London district." The Rev. Mr. Thornley and Mr. Champion have examined specimens.

Tachyporus formosus, Matth. I found an immature *Tachyporus*, which the Rev. H. S. Gorham assigns to this species, in tidal refuse at Ayr in 1894. The records for this species in Fowler (*l.c.*, ii., 195) are confined to the South of England.

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Cryptophagus distinguendus, Sturm. — I took one example amongst refuse on the margin of a pond at Bishopton in March, 1900.

Phyllotreta sinuata, Steph.—Mr. Dalglish obtained this species by sweeping at Luss in June, 1900.

Crepidodera aurata, Marsh.—One example was swept by Mr. Dalglish at Bonhill, in July, 1900.

Rhynchites nanus, Payk.—Murray, in his "Catalogue of the Coleoptera of Scotland," gave Penmanshiel Wood, Berwickshire, and Raehills as localities for this species, and the late Mr. Robert Hislop also recorded it from the outskirts of Forres (*Entomologist's Monthly Magazine*, vii. (1870-71), 11); but Dr. Sharp placed it within square brackets in his list, and stated that he had never seen a Scottish individual of the species, and that he thought it very probable that the specimens should rather be referred to *R. uncinatus*, Thoms. Examples of *R. nanus*, which have been examined by the Rev. Alfred Thornley, were taken last summer by Mr. Eden near Paisley, and by Mr. Dalglish at Bishopton.

Balaninus villosus, F.—One specimen of this fine weevil was taken by the Rev. Mr. Somerville on the north side of the Holy Loch in 1860.

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Notes on the Marine Deposits of the Firth of Forth, and their Relation to its Animal Life.

By F. G. Pearcey, Naturalist to the Fishery Board for Scotland.

[Read 27th August, 1901.]

In 1898 I was enabled to examine the deposits at present forming the floor of the Firth of Forth, and especially those found in the areas of the stations laid down for special observations by the Fishery Board for Scotland.

The Firth of Forth may be taken as extending from Alloa to the Isle of May. From Grangemouth to near Queensferry it measures 1½ miles in breadth, with a depth of less than 10 fathoms. At Queensferry it contracts to 1 mile, and the depth increases over a small area near by to 40 fathoms, but diminishes afterwards. From Queensferry the breadth increases again to 5 miles at Leith, and to 16 at Musselburgh. The firth again contracts to 8 miles between Fidra and Chapel Ness, after which it again widens to 18 miles across, where it merges with the North Sea at the May Island.

A short tract of 10 fathoms, known as the narrow deep, lies to the south of Inchkeith, and a few miles to the north-east of that island the 20-fathom area begins, tending north-eastwards, and spreading out off Largo towards both shores till quite close up to the May Island. The Isle of May is connected to the mainland of Fife by a submarine plateau, rising to within 20 fathoms from the surface, and a few miles to the eastward of it depths of over 30 fathoms commence.

The mean depth of the whole firth is 14 fathoms, the deepest water found where deposits were obtained and examined, at Station IX., is 35 fathoms.

The greatest extent of shallow water ranges from Leith to North Berwick along the south shore, across Aberlady Bay, on the south side, and from Kirkcaldy close along Largo Bay, off the coast, to Fife Ness, on the north side.

From Queensferry to Alloa the deposits cannot, in the true sense of the term, be classed among the marine deposits, as this

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area is for the most part formed of or covered by mud flats derived almost wholly from material deposited and brought there by the influence of the River Forth itself, and are therefore not taken into account in describing the deposits.

From Queensferry to Inchkeith the deposits consist for the most part of dark sandy muds in the North Channel. Drum Sands and Flats, as the name indicates, are made up of sandy and shelly muds, merging into pure sands, between Hound Point and Cramond Island; those on the middle bank comprise muddy sands to pure sands, and sand, gravel, and shells. In Leith Roads the deposits are made up of sandy mud to brown unctuous mud, which again gradually merges off into sandy muds and sand, as the water shallows, south of the south channel.

Nine stations have been laid down on the chart by the Fishery Board for special observations, over which zoological, physical, and other work has been carried on from time to time. As these stations are fairly well distributed, the deposits found at each station may be taken as typical examples of the district in question. I consider it as important, therefore, not only to give a detailed description of the deposits from each of these stations, but also lists of the animals obtained, so as more fully to ascertain what bearing, if any, the deposits, and their condition as we now find them, have upon the "Benthos" (animals that live on the bottom), the movements of the fish and their food supply, the results of which will be found in the following pages.

These stations, with the exception of VIII. and IX., which lie a little to the south-east of the Isle of May, are all situated between Inchkeith and the May Island, their positions are given in the following table, but may be better understood by reference to the accompanying chart on which they are represented :—

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No. of Station.	Locality.	Length in Miles.	Position of each End of Station.	Depth in Fathoms.	Nature of Deposits.
I.	East of Inchkeith.	4	*West End.*—Inchkeith Lighthouse bearing W. ½ S., and Long Craig, S. by W. ½ W., 1 mile. *East End.*—Wemyss Castle, N.N.W., Inchkeith Lighthouse, W. by S., 5 miles.	10 to 18	*Sandy Mud* and dead *Shells*, mottled blue-grey and brown with coal ash and clinker.
II.	North Bay of West Wemyss.	3½	*West End.*—Dysart Pier-head, N.W. by W., and Wemyss Castle, N.N.W., 2 miles. *East End.*—Buckhaven Pier-head, N.W., and Methil Pier-head, N. ½ W., 2½ miles.	10 to 15½	*Muddy Sand*, grey-brown, with coal ash and clinkers.
III.	East of Inchkeith.	7	*West End.*—Inchkeith Lighthouse, W. by N. ½ N., and Leith West Pier-head, W.S.W., 4¼ miles. *East End.*—Gullane Ness Point, S. by E., and Eyebrough Rock, E. ½ S.	7½ to 10	*Sandy Mud* and dead *Shells*, with coal ash and clinkers.
IV.	South Bay.	6½	*West End.*—Portobello Pier-head, W.S.W., and Fisherrow Pier-head, S. ½ W., 2 miles. *East End.*—Gullane Ness Point, E.S.E., and West Point, Aberlady, S. by E., 1¾ miles.	5 to 9	*Blue-grey Sandy Mud*, with dead shells, stones, coal ash, and clinkers.
V.	West of the Isle of May.	4¾	*West End.*—Craigleith, S. by W. ½ W., and May Island Lighthouse, E., 6½ miles. *East End.*—May Island, South Ness, E. by S. ¼ S., and May Island, North Ness, E. by N., 1¾ miles.	20 to 30	*Dark brown Mud.*

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No. of Station.	Locality.	Length in Miles.	Position of each End of Station.	Depth in Fathoms.	Nature of Deposits.
VI.	Off St. Monance and Pittenweem (Fluke Hole).	$1\frac{3}{4}$	*West End.*—St. Monance Pier-head, N. by E. easterly, and Pittenweem Pier-head, N.E. $\frac{1}{2}$ E., $2\frac{1}{4}$ miles. *East End.*—St. Monance Pier-head, N.W. $\frac{1}{4}$ W., and Pittenweem Pier-head, N. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles.	13 to 16	*Shell Sand.*
VII.	Off and between the Bass Rock and Fidra.	$4\frac{1}{2}$	*West End.*—Fidra Lighthouse, S.S.W., and Lamb Island, S.E. $\frac{1}{4}$ S., $1\frac{1}{2}$ miles. *East End.*—North cheek of Bass Rock, S.E. by E. $\frac{1}{4}$ E., and Tantallon Castle, S. by W. $\frac{1}{4}$ W., $1\frac{3}{4}$ miles.	12 to 17	*Blue-grey Sandy Mud* and *Sand*, with coal ash and clinker.
VIII.	Four miles south of the May Island.	$4\frac{3}{4}$ full	*South-West End.*—North cheek of Bass Rock, W. by N. $\frac{1}{4}$ N., and South Car Beacon, S.W. $\frac{3}{4}$ W., $1\frac{3}{4}$ miles full. *North-East End.*—North cheek of Bass Rock, W. by S., and May Island Lighthouse, N. by W., $3\frac{3}{4}$ miles.	$21\frac{1}{2}$ to 30	Dark brown *Sandy Mud* at north-east end; *Brown Sand* at south-west end.
IX.	Five to ten miles south-east of the May Island.	5	*South-East End.*—Dunbar Pier-head, W. by S. $\frac{1}{4}$ S., and May Island Lighthouse, N.W. $\frac{1}{2}$ N., $10\frac{3}{4}$ miles. *North-West End.*—May Island Lighthouse, N.W. by N., and Dunbar Pier-head, S.W. $\frac{1}{4}$ S., $8\frac{1}{4}$ miles.	29 to 35	*Bluish-grey* homogenous *Mud* or ooze.

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At several points over the area of each of these stations, besides numerous points outside these areas, samples of the deposits were obtained by sounding tube or dredge. In many cases fully one hundredweight of the deposit came up, which was submitted to careful washing on the spot through sieves of various material and size of mesh; all the animals noted and preserved, as also those taken by the beam trawl and tow-nets; the microscopical organisms collected and preserved for further examination, while good typical examples of the deposits, were carefully preserved and brought on shore for detailed examination and microscopical analysis. This work, which required a considerable amount of time and careful manipulation, has been accomplished by myself from time to time, as circumstances would permit.

The methods employed in the examination of these deposits are the same as those applied by Messrs. Murray and Ronard in describing the marine deposits obtained during the "Challenger" Expedition. The carbonate of calcium was determined by estimating the carbonic acid, weak and cold hydrochloric acid being used for the purpose. The part insoluble in the acid is designated residue, which, by washing, decantation, and microscopical inspection, is separated into three parts—(*a*) *Minerals*, the contraction m. di., indicating the mean diameter in millimetres; (*b*) *Siliceous organisms*, including the casts of Foraminifera and other calcareous organisms; (*c*) *Fine washings*, including those particles which, resting in suspension, pass off with the first decantations.

The numbers in brackets (20·00 per cent.) indicate the percentage of $CaCo_3$ of the whole sample.

Classification and General Character of the Deposits of the Firth of Forth.

The deposits found in the area under consideration come under the classification of shallow-water terrigenous deposits*, and are, as would be expected, of a true terrigenous character. They are mainly made up of the *débris* derived from the general disintegration of the land along the shores of the estuary and coast of the firth, from land drainage, and by solid matter borne

* After Messrs. Murray and Ronard.

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down by currents from the River Forth, in suspension, the former, however, being the chief factor from which these deposits owe their origin.

They consist for the most part of blue-grey or brown plastic sandy muds, of fine grain; along the north channel to the May Island these merge into brown sandy mud, with dead shells or shell sand, to siliceous sands, and from these to sand and stones, shingle or rock fragments, the latter forms being found in depths less than 10 fathoms, in and off bays, close inshore along the coast to the low-water mark. A well-marked reach of dark grey and brown unctuous mud extends from within four miles east of Inchkeith, spreading out north and south, funnel shaped, to within a short distance of the May Island, varying in depths from 20 to 30 fathoms. About a mile further east it merges into the grey muds or oozes of the North Sea, coloured grey on the reference chart.

On the north and south side of this area we find sandy muds, with dead shells, predominating, especially over the area of Stations I. and III.; from 18 to 10 fathoms they become more mixed and sandy, while between 10 and 5 fathoms and less they emerge into siliceous sands, with stones and rock fragments. At one or two localities, especially off St. Monance, Station VI., in 10 to 18 fathoms, we find a more or less pure shell sand, containing from 30 to 70 per cent. of carbonate of lime (see reference chart). It should be noted that coal, coal ash, and clinkers have been taken, in more or less quantities, in all the deposits examined from the Firth of Forth.

Summary of the Deposits.

The deposits obtained at Stations I. and III. are similar in composition, and to them the name "*Turritella Mud*" might appropriately be applied, on account of the great number of the dead shells of the genus bearing that name it contains, and and from which the high percentage of $CaCo_3$ is chiefly due.

A thin surface layer of brown fine argillaceous matter, in which the *Turritella* lay imbedded, is of a recent formation, and a striking feature over the whole floor of the firth, like in composition to a river mud, derived partly from material carried down from the River Forth and partly from matter thrown over from

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harbour dredgers, which are constantly at this work. The deposit beneath this again has more the character of an ordinary shallow-water marine deposit.

At Station II. the deposit was found to be similar in composition to that at Stations I. and III., with the exception that the dead *Turritella* shells and other organisms are rare in comparison. The deposit taken at Station IV. is more of a transitional character than those found at Stations I. to III. Over the area of Station IV. we pass through patches of a siliceous sand, which again merges into grey sandy mud and shells or dark-blue mud, similar to those obtained in and along the South Bay, till within the 5-fathom line. Mixed with these deposits was obtained at times masses of a blue plastic clay corresponding to material taken from the new dock workings in course of construction at Leith and deposited here by the harbour dredgers, all of which tend in no small measure to obliterate the animal life at the bottom.

At Station V. a dark-brown or grey homogenous mud of fine grain is found, which stretches over a considerable area inside the 20-fathom line to within a short distance of the May Island. Many soundings were taken in this locality, all showing the brown surface layer of river mud.

At Station VI. a typical shell sand was found, and the Mollusca, Foraminifera, and other animal remains which make up the bulk of this deposit are of interest. The majority of these are seen to be more or less infiltrated with a ferruginous-like substance, and are for the most part of a deep ferric brown—some are brown, pinkish, or white, and many of a greenish-grey colour; in some crystallization has taken place, and the majority of the material which forms this deposit, when treated with cold dilute hydrochloric acid, leaves beautiful and perfect casts of the Foraminifera and many of the other organisms, which, however, are very friable. This appears to be due to some chemical combination, which has most probably taken place inside the organisms themselves, and which I have not yet been able to determine, a feature not uncommon in many marine deposits, more especially in tropical and sub-tropical regions, where in some localities it plays an important part in forming phosphatic and other conglomerations on the sea floor; it is therefore of considerable interest to have found a similar

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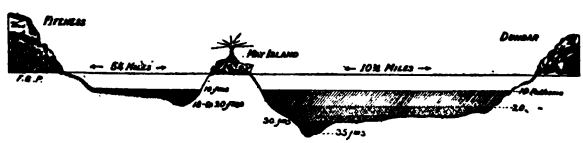
action going on in the Firth of Forth. This form of deposit, which often makes up extensive banks or reefs, can be traced for a considerable distance along the coast, till it passes off into siliceous sands, sandy muds, sand, mud, and shells, or ooze of the open sea, where life on the bottom is more prolific.

The deposits found over the areas of Stations VII. and VIII. may be taken as typical offshore transitional forms on account of their variation, for instance, at the west end of Station VII. and south-west end of Station VIII. a fine-grained, reddish-coloured siliceous sand is found, which gradually emerges into a homogenous plastic mud at points farthest from the coast line.

The deposits found at Station IX. consist of a typical marine shallow-water mud, although on its surface distinct traces of the brown, fine argillaceous material was observed, clearly demonstrating, which all my observations go to prove, how this deposit of fine mud is being laid down over the floor of the firth, diminishing gradually as the open sea is reached.

A marked feature in all the deposits examined by me between Inchkeith and the May Island is their impurity, the amount of detrital, decaying organic matter and dead remains of animals they contain. Marine life on the whole is found more abundant at Station VII., the deposit itself much cleaner and healthy looking than those found at Stations I. to VI. At Station VIII. the purity of the deposit and amount of life was found more striking (see lists of animals obtained at this station, and compare with others), and even more so at Station IX. where comparatively little foreign material was observed. It will also be observed that marine life was found to be more prolific at this station than at either of the others.



Section across mouth of the Firth of Forth through the Isle of May.

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ADDITIONAL OBSERVATIONS.

liths fully one hundredweight of the deposit, which showed three distinct layers.
ame o inches in thickness, composed of a soft, thin, dark-brown mud, amongst
tub of *Turritella terebra*. Quite 98 per cent. of these were dead shells. Many
Echi all bright pink-coloured actinia (*Bunodes coronata*), and some an ascidian
e middle layer, 4½ inches in thickness, was made up of a compact sandy mud,
s of organisms. The lower layer consisted of a dark blue unctuous clay of
n no organic remains were observed.

olit of the deposit from this station was examined, but, in comparison to Station
ranc here were much less abundant. A thin surface layer of fine brown mud
ents

olit ar mass of deposit as was obtained over the area of Station I. The sample
ranc, as also that in the dredge, showed the three distinct layers. The surface layer
Po ater quantity of the dead shells of *Turritella terebra*. The other organisms
nts. e or two exceptions, similar to those obtained at Station I.

olit a considerable quantity of the deposit both at the east and west end of the
ich a the east end was a blue-grey sandy mud containing many dead shells of *P.*
ents r bosses, of the worm tubes *Sabellaria alveolata*. At the west end the dredge
dern nd and shells with patches of blue, very coherent, plastic clay; in other parts
fragments of rounded—a few angular—fine-grained compact red Sandstone,
tose rock, ¾ to 3 inches, all more or less overgrown with balanus, serpula, and
aces of the fine argillaceous material was observable.

ents and dredge gave at this station a more typical homogeneous mud, differing from
bran I. to IV. by the absence of perfect dead shells of the larger mollusca, and the
tube, which are here more uniform, and the absence of rock fragments, with a
and argillaceous material.

iths e only a few grains of shell fragments. The dredge brought up fully one
amel sit at the middle of this station, made up chiefly of the broken-down parts of
nts h shells, from which the bulk of carbonate of lime is derived, the majority of
tube ic remains, are seen to be more or less infiltrated throughout with ferruginous
ms, dark greenish-grey in colour. In some crystallisation has taken place. All
ted with dilute hydrochloric acid, beautiful and perfect casts remain, brown,
nd grey-black. The whole of the deposit taken by dredge was carefully passed
In this way a number of smoothly-rounded and angular rock fragments and
:—Coarse and fine-grained sandstone, mica-schist, augite, diorite, gneissic rock,
measuring ⅛ to ¾ inch. Many of these were much altered. Some are perfectly
es, while others are angular.

olith of the deposit came up in the dredge showing in parts layers of shelly sand, in
ranch ud. Another haul with dredge in the *middle* of this station gave somewhat
of th ndy; while at the *west end* the dredge gave a *fine-grained reddish-brown sand*,
Echin sca, and slight traces of brown mud on the surface.
Pol

opod filled with this homogeneous mud, from which, after being washed through
s, fra *opods, Lamellibranchs, Crustacea, Echinoderms, Worms, &c., &c.*, were obtained.
s an end of this station gave a pure reddish sand, with a few shells, as *Fusus*,
, and *Asterids*.

opod
erms,

iths ught up a small quantity of bluish-grey mud, with a thin surface layer of fine mud
amell The dredge brought up a quantity of similar material, showing traces of a thin
main brown mud, which appears to owe its origin to a more recent time, probably to
fra ue argillaceous matter in suspension carried out from the River Forth. Most of
hs. rough the sieves and the organisms preserved, which are here more abundan
tations examined.

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LIST OF ANIMALS OBTAINED BY TRAWL, DREDGE, AND TOW-NET OVER THE AREAS OF THE FIRTH OF FORTH STATIONS.

Station I.—10-18 fathoms.

ABBREVIATIONS.—v.r., very rare; r., rare; f., few; fr., frequent; c., common; abdt., abundant; m., many; d., dead; l., living.

PISCES.

Lophius piscatorius, L., v.r.
Anarrhichus lupus, L., v.r.
Cyclopterus lumpus, L., v.r.
Gadus morhua, L., r.
,, *æglefinus*, L., r.
,, *virens*, L., r.
Pleuronectes platessa, L., v.r.
,, *microcephalus*, Don., r.
,, *limanda*, L., r.
Hippoglossoides limandoides, Bloch., r.
Clupea harengus, L., v.r.
,, *sprattus*, L., m. c.
Raia clavata, L., v.r.

TUNICATA.

Styelopsis grossularia, V. Ben., f. l.

MOLLUSCA.

Anomia ephippium, L., f. d.
,, *patelliformis*, L., r. d.
Ostrea edulis, L., valves, f.
Pecten opercularis, L., v.r. d.
,, *pusio*, L., valves, v.r.
Mytilus edulis, L., valves, r.
,, *modiolus*, L., r. d.
Modiolaria marmorata, Forbs., [valves, v.r.
Nucula nitida, G.B.S., r. d.
Leda minuta, Müll., v.r. d.
Cardium echinatum, L., valves, r.
,, *edule*, L., v.r. d.
Diplodonta rotundata, Mont., [valves. r.
Cyprina islandica, L., r. d.
Scrobicularia alba (Wood), f. d.
,, *prismatica*, Mont., f. l.
Solen siliqua, L., r. d.
Thracia papyracea, Poli., v.r. d.
Corbula gibba, Olivi., f. d.
Saxicava rugosa, L., f. d.
Turritella terebra, L., abdt. d.
,, *terebra*, var. *nivea*, Jeff., [r. d.
Buccinum undatum, L., v.r. d.
,, *undatum*, eggs of, l. [colonies.
Fusus antiquus, L., v.r. d.

CRUSTACEA.

Hyas coarctatus, Leach, r.
Zoœa of Brachyura, f.
Eupagurus bernhardus (L.), r.
,, *pubescens* (Kroyer), r.
Porcellana longicornis, Penn., v.r.
Crangon vulgaris, Fabr., f.
Hyperia galba (Mont.), v.r.
Calanus finmarchicus (Gunn.), f.
Caligus rapax., M. Edw., f.
Candaciapectinata, Brady, f.
Hyperoche turriformis, r.
Parathemisto oblivia, abdt.
Peroculodes longimanus, f.
Alteutha, sp? f.
Metopa, sp? r.
Balanus hameri, Ascan., v.r.
,, *balanoides* (L.), c.
,, *crenatus* (Brug.), v.r.

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VERMES.

Tomopteris onisciformis, Esch., r.
Serpula vermicularis, Ellis, r. d.
,, *triquetra* (Linné), v.r.
Polynoë squamata (Johnst.), r.
Pectinaria belgica (Pallas), r. d.
Glycera dubia, Blainv., v.r.
,, *alba* (Müll.), r.
Phascolosoma strombi (Mont.), v.r.
Pontobdella muricata (L.), r.
Sagitta bipunctata, Q. and G., f.
Alcyonidium parasiticum, Flem., f.
Membranipora pilosa, Linné, v.r. d.
Flustra papyracea, Ell. and Sol., v.r.
Gemellaria loricata (Linn.), f.

ECHINODERMATA.

Echinus esculentus, L., v.r. d.
,, *miliaris*, L., v.r.
Echinocardium flavescens, O.F.M., [v.r.
Asterias rubens, L., r.
Solaster papposus, Fabr., v.r.
Ophiothrix fragilis, Abild, f.
Ophiura ciliaris, L., f.
Ophiura albida, Forb., v.r.

ACTINOZOA AND HYDROZOA.

Uticina crassicornis ? O.F.M., abdt. [on dead Turritella shells.
Alcyonium digitatum, L., r.
Hydrallmania falcata, L., v.r.
Beroë ovata, Lam., r.
Clytea johnstoni, Ald., v.r.
Companularia flexuosa, Hincks, r.
Cydippe pomiformis ? f.

FORAMINIFERA.

Biloculina depressa, d'Orby, v.r. d.
Miliolina seminulum, L., r.
,, *oblonga*, Montag., v.r.
Reophax fusiformis, Will., r. d.
,, *scorpiurus*, Montf., v.r. d.
Haplophragmium pseudo-spirale, [Will., f.
,, *canariense*, [d'Orby, r.d.
Textularia porrecta, Brady, v.r. d.
Spiroplecta sagittula, Defr., v.r. l.
Gaudryina filiformis, Ber., f. d.
Virgulina subsquamosa, d'Orby, r.
Bolivina plicata, d'Orby, v.r. d.
,, *pygmæa*, d'Orby, v.r. d.
Bulimina elegans, d'Orby, v.r. d.
,, *marginata*, d'Orby, f. l.
,, *exilis*, Goes., v.r.
Bulimina elegantissima, d'Orby, v.r.
Lagena striata, d'Orby, r. l.
,, *sulcata*, W. and J., l.
,, *Williamsoni*, Alcock, f.
,, *vulgaris*, Will., r. l.
,, *lævis*, Montagu, r.
Nodosaria communis, d'Orby, v.r. d.
Cristellaria gibba, d'Orby, v.r. d.
Discorbina orbicularis, Terg., f.
,, *globularis*, d'Orby, r. l.
,, *rosacea*, d'Orby, r.
Planorbulina mediterraniensis, [d'Orby, r.
Truncatulina lobatula, W. and J., [v.r. d.
Rotalia beccarii, L., c. chiefly d.
Polystomella striato-punctata, L. and [M., f.
Polystomella arctica, P. and J., r. d.

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Station II., North Bay of West Wemyss.—10-15½ fathoms.

Pisces.

Lophius piscatorius, L., f.
Anarrhichus lupus, L., v.r.
Gadus morhua, L., r.
,, *æglefinis*, L., f.
,, *merlangus*, L., f.
Pleuronectes platessa, L., r.
,, *limanda*, L., r.
Hippoglossoides limandoides, Bloch.
Raia radiata, Don., v.r.
,, *clavata*, L., r.

Tunicata.

Ascidia mentula, O.F.M., v.r.
Ascidiella virginea, O.F.M., f.
Botrylloides rubrum, M.Edw., v.r.

Mollusca.

Pecten opercularis, L., r. d.
Nucula nitida, G.B.S., v.r. d.
Scrobicularia alba, Wood, r. d.
,, *prismatica*, Mont., [r. d.
Solen siliqua, L., v.r. d.
,, *pellucidus*, Penn, one, l.
Saxicava rugosa, L., valves, f.
Pholas candida, L., v.r. d.
Dentalium entalis, L., three, d.
Eulima intermedia, L., one, dead.
Rissoa, sp? r. d.
Aporrhaïs pes pelecani, L., two, d.
Buccinum undatum, L., r. d.
Fusus antiquus, L., one, d.
Nassa reticulata, L., r. d.
Polycera, sp? v.r.
Loligo vulgaris, Lnk., one, l.

Crustacea.

Carcinus mænas (L.), v.r. l.
Cancer pagurus, L., v.r. l.
Nephrops norvegicus (L.), f.
Eupagurus bernhardus (L.), r.
Calanus finmarchicus (Gunner), f.
Parathemisto oblivia, f.
Caligus rapax, M.E., v.r.
Hyperoche tauriformis, r.
Thysanoessa, sp? f.

Vermes.

Tomopteris onisciformis, Esch., f.
Sabella pavonia (Savegny), f.
Nereis pelagica (L.), v.r.
Pectenaria belgica (Pallas), v.r.
Gemellaria loricata (L.), f.
Membranipora pilosa (L.), r.
Aphrodite aculeata (L.), r.
Polynoe squamata (Johnston), f.
Sagitta bipunctata, Q. and G., f.
Flustra foliacea, L., r. d.
Alcyonidium parasiticum, Flem., f.

Echinodermata.

Echinus esculentus, L., one, d.
Spatangus purpureus, Mull., r.
Echinocardium flavescens, O. Ed. [Mull., three, d.
Ophiura ciliaris, L., f. l.
Asterias rubens, L., f.
Ophiothrix fragilis, Abild., r.

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Hydrozoa.

Alcyonium digitatum, L., r.
Sertularia arbietina, L., v.r.
Hydrallmania falcata, L., r.

Foraminifera.

Miliolina seminulum, L., r. l.
,, *circularis*, Bom., v.r. d.
,, *oblonga*, Montague, v.r. l.
Hippocrepina, sp ? nov. v.r.
Reophax scorpiurus, Montf., v.r. [chiefly d.
,, *fusiformis*, Will., f. l.
,, *Scotti*, Chaster, v.r. l.
Haplophragmium pseudo-spirale, [Will., f. l.
,, *canariensis*, [d'Orby, f. d.
Textularia porrecta, Brady, v.r. d.
Spiroplecta sagittula, Defr., v.r. l.
Gaudryina filiformis, Ber., f. d.
Virgulina subsquamosa, d'Orby, f. d.
Clavulina obscura, d'Orby, v.r. d.
Bolivina decussata, r. d.
,, *punctata*, d'Orby, f. d.
,, *pygmæa*, d'Orby, r. d.
Bulimina elegans, Brady, v.r. l.
,, *marginata*, d'Orby, c. l.
,, *exilis*, Brady, v.r. d.
,, *elegantissima*, d'Orby, [v.r. d.
,, *contraria*, Will., v.r. d.
Cassidulina crassa, d'Orby, v.r. d.
Nodosaria filiformis, Brady, v.r. d.
Cristellaria cultrata, Mont. ? young, [one d.
Polymorphina communis, Will., v.r.
Uvigerina angulosa, Will., v.r. d.
Lagena sulcata, W. and J., f. l.
,, *Williamsoni*, Alcock, r. d.
,, *vulgaris*, Will., r. l.
,, *lævis*, Mont., f. d.
,, *squamosa*, Mont., r. d.
,, *quadricostulata*, Rss., v.r. d.
,, *globosa*, Mont., r. d.
,, *quadrata*, Will., r. d.
,, *semistriata*, Will., r. d.
,, *marginata*, W. and B., r. d.
Globigerina bulloides, d'Orby, r. d.
Discorbina orbicularis, Terg., f. [chiefly d.
,, *globularis*, d'Orby, r. d.
,, *rosacea*, d'Orby, f. [chiefly d.
Planorbulina mediterraniensis, [d'Orby, f. d.
Truncatulina lobatula, W. and J., r. d.
Rotalia beccarii, L., c. l. and d.
Nonionina turgida, Will., v.r. d.
Polystomella striato-punctata, F. and [M., c. d.
,, *arctica*, P. and J., r.d.

Station III., East of Inchkeith.—7½-10 fathoms.

Pisces.

Lophius piscatorius, L., r.
Anarrhichus lupus, L., v.r.
Gadus morhua, L., v.r.
,, *æglefinus*, L., r.
,, *merlangus*, L., v.r.
Merluccius vulgaris, Cuv., v.r.
Pleuronectes platessa, L., v.r.
Pleuronectes microcephalus, Don., v.r.
,, *cynoglossus*, L., r.
,, *limanda*, L., f. r.
Hippoglossoides limandoides, r.
Clupea harengus, L., r.
,, *sprattus*, L., f. r.
Raia clavata, L., v.r.
Raia batis, L., v.r.

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TUNICATA.

Styelopsis glossularia, V. Ben., f. r. l.

MOLLUSCA.

Ostrea edulis, L., v.r. d.
Pecten opercularis (L.), r. m. d.
Mytilus edulis, L., v.r. d.
Cardium edule, L., v.r. d.
Cyprina islandica (L.), f. d.
Scrobicularia prismatica (Mont.), f. l.
,, *alba* (Wood), r. d.
Solen siliqua, L., v.r. d.
Thracia papyracea (Poli.), v.r. d.
Buccinum undatum, L., r. d.
Fusus antiquus (L.), v.r. d.

CRUSTACEA.

Hyas araneus, L., one.
,, *coarctatus*, Leach, v.r.
Eupagurus Bernhardus (L.), f.
,, *cuanensis* (Thomp.), one.
Balanus balanoides, (L.), f. d.
,, *hameri*, Ascanius, v.r. d.
,, *crenatus*, (Brug.), v.r. d.
Nephrops norvegicus (L.), r.
Pandalus montagui, Leach, r.
Thysanoessa, sp. f.
Parathemisto oblivia (Kr.), r.
Mysidopsis gibbosa, G.O.S., f.
Macromysis flexuosus (Mull.), f.
Schistomysis spiritus (Norm.), f.
,, *ornatus* (Sars.), f.
Diastylus, sp ? f.
Parathylus swammerdami (M. [Edw.), f.
Calanus finmarchicus (Gunner), f. r.
Hyperoche tauriformis (Bate), f.
Erythrops Goessi, f. r.
Lyanasidid, sp. f.
Iphimidea obesa, Pathke, f.
Caligus rapax, M. Edw., f.
Perioeculodes longimanus (Bate), f.

VERMES.

Tomopteris onisciformis, Esch., fr.
Sagitta bipunctata, Q. and G., fr.
Membranipora pilosa, L., r.
Flustra securifrons, Pall., v.r. d.
Flustra foliacea, L., v.r. l.
Membranipora membranacea, L., [v.r. d.

ECHINODERMATA.

Echinus esculentus, L., v.r. young, l.
Solaster papposus, Fabr., one, l.
Ophiura albida, Forbs., one l.
Asterias rubens, L., f. l.
Ophiothrix fragilis, Abild., fr.

ACTINOZOA AND HYDROZOA.

Actinoloba dianthus (Ellis), one.
Cydippe pomiformis ? f.
Bunodes coronata, Penn., m. l. on [dead Cyprina valves.
Sertularia argentea, E. and Sol., v.r.

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Foraminifera.

Biloculina depressa, d'Orby, v.r. d.
,, *oblonga*, d'Orby, v.r. d.
Miliolina seminulum, L., f., chiefly [d.
Reophax scorpiurus, Montf., f. [chiefly d.
,, *fusiformis*, Will., r. l.
,, *Scotti*, Chaster, v.r.
Haplophragmium pseudo-spirale, [Will., r.d.
,, *canariensis*, [d'Orby, v.r. d.
Spiroplectra sagittula, Defr., r. d.
Gaudryina filiformis, Ber., r.
Virgulina squamosa, d'Orby, v.r. d.
Bolivina plicata, d'Orby, v.r. d.
Bulimina marginata, d'Orby, r. l.
,, *elegans*, d'Orby, r. d.
,, *exilis*, Brady, v.r. d.
Lagena sulcata, W. and J., r. d.
,, *vulgaris*, Will., r. d.
,, *lævis*, Montague, r. l.
,, *Williamsoni*, Alcock, v.r. d.
Discorbina rosacea, d'Orby, r. d.
,, *globularis*, d'Orby, v.r. d.
Rotalia beccarii, L., f., chiefly d.
Polystomella striato-punctata, F. and [M., r. d.

Station IV., South Bay.—5-9 fathoms.

Pisces.

Cottus scorpius, L., v.r.
Lophius piscatorius, L., r.
Gadus morhua, L., r.
,, *merlangus*, L., r.
Pleuronectes platessa, L., r.
,, *flesus*, L., v.r.
Pleuronectes microcephalus, Don., r.
Hippoglossoides limandoides, [Bloch., r.
Pleuronectes limanda, L., f.
Nerophis aquareus, L., one.
Raia radiata, Don., v.r.

Tunicata.

Ascidiella virginea, O.F.M., v.r. l.

Mollusca.

Anomia ephippium, L., f. d.
Pecten opercularis, L., one l., m. d.
Mytilus edulis, L., r.d.
,, *barbatus*, L., v.r. d.
,, *modiolus*, L., r. d.
Modiolaria marmorata, Forb., [v.r. d.
Cardium echinatum, L., r. d.
,, *edule*, L., r. d.
Tapes pullastra, L., r. d.
Donax vittatus, Dal., v.r. d.
Scrobicularia alba (Wood), v.r. d.
Scrobicularia prismatica, Mont., f. l.
Diplodonta rotundata, Mont., one d.
Mya arenaria, L., r. d.
,, *truncata*, L., v.r. d.
Saxicava rugosa, L., f. d.
Turritella terebra, L., c. d.
,, *var. alba*, f. d.
Buccinum undatum, L., f. d.
Fusus antiquus, L., r. d.
Eolis viridis (Forb.), r.
Eolis Landsburgi, v.r.
Polycera ocellata, Ald. and Han., r.

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CRUSTACEA.

Bottom forms—

Eupagurus Bernhardus (L.), one.
Pandalus brevirostris, Rathke, v.r.
,, *montagui*, Leach, v.r.
Balanus balanoides, L.. r.d.
Portunus holsatus, Fabr., one l.
Porcellana longicornis, one l.
Hyas araneus (L.), one l.
Cuma scorpioides (Mont.), r. l.

Pelagic forms—

Schistomysis spiritus, Norm., v.r.
Euphasidiæ, r.
Hyperia galba (Montagu), v.r.
Hyperoche tauriformis (Bate), r.
Calanus finmarchicus (Gunner), f.
Temora longicornis, Müll., f.
Parathemisto oblivia (Kr.), r.
Eurydice pulchra, Leach, v.r.
Caligus rapax, M.E., r.
Acartia, sp? r.
Pseudo calanus elongatus, Baird, f.
Longipedia cornuata, Clause., f.

VERMES.

Tomopteris onisciformis, Esch., r.
Serpula vermicularis, Ellis, f. d.
Nereis pelagica, L., r. l.
Polynoë reticulata, Clop., r.
Sagitta bipunctata, Q. and G., f.
Pontobdella muricata, (L.), one l.
Sabellaria alveolata, m. c. on [stones and shells, d. and l.
Gemellaria loricata (L.), r. d. [colonies.
Membranipora membranacea, L., [v.r. d.
Flustra securifrons, Pall., v.r.
Alcyonidium parasiticum, Flem., r.

ECHINODERMATA.

Echinus esculentus, L., v.r. young, l.
Asterias rubens, L., v.r. young, l.
Ophiothrix fragilis, Abild., v.r. l.
Solaster papposus, Fabr., v.r. young.
Ophiura ciliaris, L., one.

HYDROZOA AND ACTINOZOA.

Bunodes coronata, Penn., moderately [c. on d. Turritella.
Alcyonidium digitatum, L., two [colonies.

FORAMINIFERA.

Nubecularia lucifuga, Defr., v.r. d.
Biloculina elongata, d'Orby, f.
Miliolina seminulum, L., m. c. f. l.
,, *oblonga*, Mont., r.
,, *venusta*, Kar., v.r. d.
,, *circularis*, Bom., v.r. d.
Spiroloculina limbata, d'Orby, one d.
Cornuspira involvens, Rss., v.r. [fragt.
Reophax scorpiurus, Montf., f.
,, *fusiformis*, Will., r.
,, *Scotti*, Chaster, two [specimens.
Haplophragmium canariensis, [d'Orby, one.
,, *pseudo-spirale*, [Will., r. d.
Textularia gramen, d'Orby, r. d.

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Spiroplecta sagittula, Defr., r.
Verneulina polystrophia, Rss., v.r.
Gaudryina filiformis, Ber., f. d.
Bulimina elegans, d'Orby, v.r. d.
,, *marginata*, d'Orby, v.r.
,, *elegantissima*, d'Orby, r. d.
Bolivina decussata, d'Orby, v.r.
,, *punctata*, d'Orby, r.
,, *difformis*, Will., v.r. d.
Lagena globosa, Montagu, r. d.
,, *marginata*, W. and B., r.
,, *semistriata*, Will., f.
,, *striata*, d'Orby, f.
,, *squamosa*, Mont., f.
,, *lævis*, Mont., m. c.
,, *Williamsoni*, Alcock, r. d.
,, *vulgaris*, Will., f.
,, *gracillima*, Segu., f.
,, *distoma*, D. and J., v.r.
,, *costata*, Will., v.r.
,, *quadricostulata*, Rss., v.r.
,, *lagenoides*, Will., r.
Nodosaria filiformis, L., r.
,, *radicula*, L., v.r. d.
Nodosaria pyrula, d'Orby, v.r.
,, *scalaris*, Batsch, f.
Cristellaria crepidula, F. and M., [v.r. d.
,, *gibba*, d'Orby, v.r. d.
Polymorphina lactea, W. and J., r.
,, *elegantissima*, Will., [r. d.
Discorbina orbicularis, Terg., f. [chiefly d.
,, *globularis*, d'Orby, f. [chiefly d.
,, *rosacea*, d'Orby, m. c. [chiefly d.
Planorbulina mediterraniensis, [d'Orby, f. d.
Gypsina inhaerens, Schul., m. c. [chiefly d.
Rotalia beccarii, L., c. m. d.
Polystomella striato-punctata, F. and [M., m. c. chiefly d.
,, *subnodosa*, d'Orby, f. d.
,, *arctica*, P. and J., v.r. d.
Nonionina turgida, Will., v.r.

Station V.—20-30 fathoms.

Pisces.

Zeus faber, L., one.
Anarrhichus lupus, L., one.
Gadus morhua, L., r.
,, *æglefinus*, L., r.
Gadus merlangus, L., r.
Pleuronectes platessa, L., v.r.
,, *cynoglossus*, L., f.
,, *limanda*, L., r.
Hippogloissoides limandoides, Bloch., v.r.

Mollusca.

Turritella terebra, L., r. d.
Natica alderi, Forb., v.r. d.
Fusus antiquus, L., v.r.
,, *gracilis*, Da.C., one d.
Pecten opercularis, L., valves, r.
,, *pusio*, L., v.r. d.
Leda minuta, Müll., r. d.
Scrobicularia prismatica, Mont., f. l.
Scrobicularia alba (Wood), f. d. three l.

Crustacea.

Eupagurus bernhardus (L.), one.
Nephrops norvegicus (L.), v.r.
Pandalus montagui, Leach, v.r.
Schistomysis spiritus? Norm., r.
Pseudocuma cervaria, Van. Ben., r.
Parathylus swammerdami [(M. Edw.), f.
Parathemisto oblivia (Rr.), f.
Calisoma crenata (Bate), fr.
Thysanoessa, sp? fr.
Caligus rapax, M. Edw., f.
Calanus finmarchicus (Gunner), fr.

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ECHINODERMATA.

Spatangus purpureus (O. F. Mull), [young, r.
Asterias rubens, L., young, f.
Ophiura albida, L., v.r.
Amphiura filiformis, (O. F. Mull), r.

VERMES.

Phascolasoma vulgare (Mont.), [one l.
Serpula vermicularis, Ellis, v.r. l.
Trophonia glauca, Malm., v.r. l.
Pectenaria belgica (Pallas), r. l.
Sabellaria alveolata, L., f. l.
Aphrodite aculeata, (L.), one.
Nephthys cæca, Fab., one.
Glycera alba, Blain, one.
Ammotrypane aulogaster, Rath., [one.
Tomopteris onisciformis, Esch., f.
Pigalion idunæ, v.r.
Membranipora membranacea, L., r.
,, *pilosa*, L., r.
Sagitta bipunctata, Q. and G., f. r.

ACTINOZOA AND HYDROZOA.

Actinoloba dianthus, Ed., one l.
Virgularia mirabilis, Lamk., one l.
Alcyonium digitatum, L., v.r. l.
Sertularia argentea, L., v.r. l.
Aurila aurita, Lamk., one.
Ctenophora, fr.

FORAMINIFERA.

Biloculina depressa, d'Orby, one l.
,, *oblonga*, d'Orby, v.r. l.
Miliolina seminulum, L., r. l.
,, *oblonga*, Mont., one d.
Cornuspira involvens, Rss., one d.
Reophax scorpiurus, Will., f. l.
,, *Scotti*, Chaster, one l.
,, *fusiformis*, Will., r. l.
Haplophragmium pseudo-spirale, [Will., f. l. and d.
,, *canariensis*, [d'Orby, v.r. l.
Spiroplecta sagittula, Defr., v.r. l.
Gaudryina filiformis, Ber., f. l.
Virgulina subsquamosa, d'Orby, [v.r. d.
Bolivina plicata, d'Orby, v.r. d.
,, *nobilis*, d'Orby, v.r. l.
Bulimina marginata, d'Orby, r. l.
,, *exilis*, Brady, v.r. l.
,, *aculeata*, d'Orby, v.r. d.
Cassidulina crassa, d'Orby, v.r. d.
Lagena striata, d'Orby, r. l.
,, *Williamsoni*, Alcock, r. l.
Lagena sulcata, W. and J., r. l.
,, *vulgaris*, Will., r. l.
,, *lævis*, Mont., v.r. d.
,, *squamosa*, Mont., v.r. l.
,, *globosa*, Mont., v.r. d.
,, *semistriata*, Will., v.r. l.
,, *marginata*, W. and B., [v.r. l.
,, *gracillima*, Segu., v.r. l.
,, *quadricostulata*, Rss., [v.r. d.
,, *gracilis*, Will., v.r. d.
,, *costata*, Will., one d.
Nodosaria communis, d'Orby, v.r. d.
,, *pyrula*, d'Orby, v.r. l.
Cristellaria gibba, d'Orby, one l.
Polymorphina lactea, W. and J., v.r. l.
,, *communis*, d'Orby, one.
Discorbina orbicularis, Terg., v.r.
,, *globularis*, d'Orby, v.r. d.
,, *rosacea*, d'Orby, v.r. d.
Rotalia beccarii, L., f. l.
Polystomella striato-punctata, v.r. d.
,, *arctica*, P. and J., one d.

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Station VI., off St. Monans.—13-16 fathoms.

Pisces.

Gadus morhua, L., r.
,, *æglefinus*, L., r.
,, *merlangus*, L., r.
Rhombus lævis, Rond., v.r.
Pleuronectes platessa, L., r.
,, *microcephalus*, Don., r.
,, *limanda*, L., f.
Hippoglossoides limandoides, Bloch., r.

Mollusca.

Anomia patelliformis, L., frag., [m. c.
,, *ephippium*, L., d.
Pecten opercularis, L., c. d.
,, *pusio*, L., r. d.
,, *varius*, L., frag., r.
,, *striatus*, Müll., v.r. d.
Mytilus modiolus, L., f. d.
,, *edulis*, L., frag., m. c.
Nucula nitida, G.B.S., r. d.
Leda minuta, Mull., v.r. d.
Cardium edule, L., c. d., frag., c.
,, *echinatum*, L., f. frag., d.
Cyprina islandica, L., frag., m. c.
Astarte compressa (Mont.), r. d.
,, *sulcata*, Da. C., r. d.
Venus fasciata, Da. C., frag., c.
,, *lineta*, Pult., frag., d.
,, *exoleta*, L., frag., c.
Tellina crassa, Penn., r. d.
,, *pusilla*, Phill., r. d.
,, *balthica*, L., m. c. d.
Donax, *sp.*, frag., d.
Mactra solida, L., c. d.
Solen ensis, L., r. d.
Solen siliqua, L., f. d.
Thracia papyracea, Poli., r. d.
Corbula gibba, Olivi., r. d.
Saxicava rugosa, L., frag., m. c.
Patella vulgata, L., f. m. c.
Helcion pellucidum, L., frag., d.
Trochus tumidus, Mont., frag., d.
,, *umbilicatus*, Mont., d. m. c.
Rissoa proxima, r. l., f. d.
,, *violacea*, Desm., f. l., d. f.
Cæcum glabrum, Mont., f. l., m. c. d.
Odostomia insculpta, Mont., r. l., d. f.
,, *acuta*, r. l., d. f.
,, *albella*, Lov., r. l., d. f.
Eulima polita, L., r. l., d. r.
Natica alderi, Forb., r. l., f. d.
Aporrhais pes-pelecani, L., frag., m. c.
Buccinum undatum, L., frag., m. c. d.
Fusus gracilis, Da. C., v.r. d.
Nassa incrassata, Str., d. r.
Pleurotoma turricula, Mont., r. d.
Utriculus mamillatus, Phil., r. d.
Dentalium entale, L., f. m. c.
,, *tarentinum*, Lmk., f. m. c.
Chiton ruber, Mont., f. l.

Crustacea.

Carcinus mœnas, Penn., v.r.
Paratylus, *sp?* fr.
Mysis, *sp?* r.
Calisoma crenata (Bate), f.
Temora longicornis, Müll., r.
Parathemisto oblivia (Kr.), fr.
Thysanoessa, sp? fr.
Caligus rapax, M. Edw., fr.
Calanus finmarchicus (Gunner), f.

Vermes.

Serpula vermicularis, Ellis, frag., c.
Nereis pelagica, L., v.r.
Tomopteris onisciformis, Esch., fr.
Serpula triquetra, L., frag., m. c.
Sagitta bipunctata, Q. and G., fr.
Membranipora hexagona, Bush., r. d.
,, *pilosa*, L., r. d.
Flustra securifrons, Pall., r.

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Echinodermata.

Echinus esculentus, L., frag., m. c.
Echinocyamus pusillus, O.F.M., [f. l., c. d.
Henricia sanguinolenta, O.F.M., r.
Spatangus purpureus, Müll., frag., r.
Asterias rubens, L., young, fr.

Hydrozoa and Actinozoa.

Sertularia abietina, L., v.r.
Ctenophora, fr.
Alcyonium digitatum, L., v.r., [young colonies.

Foraminifera.

Biloculina depressa, d'Orby, v.r. d.
,, *elongata*, d'Orby, d.
Miliolina circularis, Bom., f. d.
,, *seminulum*, L., f. d.
,, *venusta*, Kar., v.r. d.
,, *oblonga*, Mont., v.r. d.
Spiroloculina limbata, d'Orby, v.r. d.
Hyperammina arborescens, Norm., [v.r.
Reophax findens? P., v.r. d.
Haplophragmium canariensis, [d'Orby, f. d.
Ammodiscus gordialis, Pch. J., d.
Textularia gramen, d'Orby, r. d.
Spiroplecta sagittula, Defr., f. d.
Verneuilina polystropha, Rss., r. d.
Bulimina marginata, d'Orby, v.r. d.
,, *elegans*, d'Orby, v.r. d.
Bolivina decusata, d'Orby, v.r. d.
Lagena vulgaris, Will., r. d.
,, *globosa*, Mont., r. d.
Lagena marginata, W. and B., r.
,, *trigono-marginata*, Will., [v.r. d.
,, *striata*, d'Orby, m. c. l. and d.
,, *Williamsoni*, Alcock, f. l. [and d.
Nodosaria communis, d'Orby, v.r. d.
Polymorphina lactea, W. and J., v.r.
,, *oblonga*, Will., v.r.
,, *communis*, Will., v.r.
Patellina corrugata, Will., v.r.
Discorbina orbicularis, Terg., f. d.
,, *rosacea*, d'Orby, m. c. d.
Truncatulina lobatula, W. and J., [v.r. d.
Planorbulina mediterraniensis, [d'Orby, r.d.
Rotalia beccarii, L., c. l. and d.
Polystomella striato-punctata, F. and [M., f. l. and d.
,, *arctica*, P. and J., r. d.

Station VII.—21½-30 fathoms.

Pisces.

Lophius piscatorius, L., r.
Callionymus lyra, L., one.
Labrus maculatus, Bl., one.
Centronotus gunnellus, Bl., one.
Gadus morhua, L., f.
,, *æglefinus*, L., f.
,, *merlangus*, L., r.
,, *luscus*, L., one.
Pleuronectes platessa, L., f.
,, *microcephalus*, Don., f.
Pleuronectes cynoglossus, L., f.
,, *limanda*, L., f.
,, *flesus*, L., one.
Hippoglossoides limandoides, [Bloch., r.
Clupea harangus, L., f.
,, *sprattus*, L., f.
Raia clavata, L., r.
,, *radiata*, Don., r.
,, *batis*, L., v.r.

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TUNICATA.

Ascidia mentula, O.F.M., r. l.
Styelopsis glossularia, V. Ben., r. l.
Ascidiella virginea, O.F.M., f. l.

MOLLUSCA.

Anomia ephippium, L., valves, f.
Ostrea edulis, L., valves, v.r.
Pecten opercularis, L., v.r. d.
,, *pusio*, L., v.r. d.
Mytilus edulis, L., f. d.
,, *modiolus*, L., f. l.
Nucula nitida, G.B.S., v.r. d.
Leda minuta, Müll., v.r. d.
Loripes lacteus, L., v.r. d.
Diplodonta rotundata, Mont., r.
Cardium echinatum, L., f., young, l.
Venus casina, L., valves, young, f.
Mactra elliptica, Bro., r. d.
Solen pellucidus, Penn., f. l.
Thracia papyracea, Poli., v.r., d.
Corbula gibba, f. d., one l.
Saxicava rugosa, L., v.r. d. f.
,, var. *arctica*, L.
Pholas crispata, L., valve, v.r.
Trochus tumidus, Mont., v.r. d.
Turritella terebra, L., f. d., r. l.
Natica alderi, Forb., r. l.
Velutina lævigata, Penn., r. l.
Fusus antiguus, L., r. l.
Buccinum undatum, L., f. l.
Actæon tornatilis, L., v.r. d.
Dentalium entalis, L., f. d., r. l.
,, *tarentinum*, Lmk., r. l.
Loligo vulgaris, Lmk., r. l.
Octopus vulgaris, Lmk., one l.

CRUSTACEA.

Bottom living—

Cancer pagurus, L., v.r. l.
Portunus depurator, (L.), two l.
,, *holsatus*, Fabr., v.r.
Eupagurus bernhardus (L.), v.r. l.
Pandalus montagui, Leach, r. l.
Idotea lincaris, L., r. l.
Atylus bispinosus, r.

Pelagic—

Eurydice pulchra (Slabb), r.
Erythrops Goesii, f.
Calissoma crenata (Bate), f.
Paratylus swammerdami (M. [Edw.), f.
Parathemisto oblivia (Kr.), c.
Hyperoche tauriformis (Bate), r.
Paratylus, sp? f.
Caligus rapax, M. Edw., f.
Calanus finmarchicus (Gunner), fr.
Balanus hameri, Ascan., r. l.
,, *balanoides*, L., f. d.

VERMES.

Sagitta bipunctata, Q. and G., fr.
Pectinaria belgica, Pallas, f. l.
Sabella pavonia, Sav., r. l.
Tomopteris onisciformis, Esch., fr.

ECHINODERMATA.

Echinus esculentus, L., frag. of tests.
Echinocardium flavescens, O.F.M., [v.r., young, l.
Solaster endica, L., one l.
Ophiura albida, Forb., f. l.
Spatangus purpureus, Müll., v.r., [young, l.
Asterias rubens, L., v.r. l.
Henricia sanguinolenta, O.F.M., one l.
Amphiura filiformis, O.F.M., f. l.

ACTINOZOA.

Virgularia mariabilis, Lamk., r. l.
Alcyonium digitatum, L., r. l.

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Foraminifera.

Biloculina depressa, d'Orby, f. l.
,, *oblonga*, Mont., f. l.
Miliolina seminulum, L., f. l.
,, *boueana*, d'Orby, r. d.
Spiroloculina limbata, d'Orby, r. l.
Cornuspira foliacea, Philip, r. d.
Astrorhiza limicola (Sandahl), f. l.
Reophax scorpiurus, Montf., f. l.
,, *Scotti*, Chaster, r. l.
,, *fusiformis*, Will., f. l.
Haplophragmium canariensis, [d'Orby, v.r. l.
,, *pseudo-spirale*, [Will., r. l.
Textularia gramen, d'Orby, r. d.
Spiroplecta sagittula, Defr., f. l.
Verneulina polystrophia, Rss., r. l.
Gaudryina filiformis, Ber., f. l.
Bulimina marginata, mod., [d'Orby, c. l.
,, *elegans*, d'Orby, r. l.
,, *elegantissima*, d'Orby, r. l.
,, *aculeata*, d'Orby, v.r. l.
Virgulina schreibersiana, Czjz., [one l.
,, *texturata*, d'Orby, v.r. d.
,, *subsquamosa*, d'Orby, r. l.
Bolivina punctata, d'Orby, r. d.
,, *reticulata*, Rss., v.r. d.
Cassidulina subglobosa, Brady, [v.r. d.
Lagena sulcata, W. and J., r. l.
,, *striata*, d'Orby, r. l.
Lagena gracillima, Segu., f. l.
,, *distoma*, P. and J., f. l.
,, *lævis*, Mont., f. l.
,, *marginata*, W. and B., l.
,, *globosa*, f. l.
,, *squamosa*, Mont., r. l.
,, *quadricostulata*, Rss., r. l.
Nodosaria scalaris, Bate., v.r. l.
,, *pyrula*, d'Orby, v.r. l.
,, *communis*, d'Orby, one d.
Cristellaria rotulata, Lamk., one l.
,, *gibba*, d'Orby, r. l.
Polymorphina communis, d'Orby, [vr. l.
,, *lanceolata*, Rss., v.r. d.
Uvigerina pygmæa, d'Orby, v.r. d.
Globigerina bulloides, d'Orby, v.r. d.
,, *triloba*, Brady, v.r. d.
Patellina corrugata, Will., v.r. d.
Discorbina globularis, d'Orby, r. l. [and d.
,, *orbicularis*, Terg., v.r. d.
,, *rosacea*, d'Orby, v.r. d.
Truncatulina lobatula, W. and J., [r. d.
Rotalia beccarii, L., c. l. and d.
Gypsina inhærens, Schul., f. l. and d.
Nonionina scapula, F. and M., v. r. l.
Operculina ammonoides, Gron., r. d.
Polystomella striato-punctata, F. and [M., r. d.
,, *sub-nodosa*, d'Orby, v.r. l.
,, *arctica*, P. and J., v.r. d.

Station VIII.—21½-30 fathoms.

Pisces.

Cottus scorpius, L., v.r.
Trigla gurnardus, L., f.
Lophius piscatorius, L., v.r.
Gadus morhua, L., r.
,, *æglefinus*, L., m. c.
,, *merlangus*, L., f.
Pleuronectes platessa, L., r.
,, *flesus*, L., one.
,, *microcephalus*, Don., r.
Pleuronectes cynoglossus, L., f.
,, *limanda*, L., f.
Hippoglossoides limandoides, [Bloch., r.
Arnoglossus megastoma, Don., one.
Clupea harengus, L., r.
Raia clavata, L., r.
,, *batis*, L., v.r.
,, *radiata*, Don., v.r

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TUNICATA.

Ascidia mentula, O.F.M., v.r. l.
Eugyra glutinaris? Möll., f. l.
Ascidella virginea, O.F.M., thirteen l.
Styelopsis grossularia, V. Ben., v.r. l.

MOLLUSCA.

Anomia ephippium, L., f. l.
Pecten opercularis, L., d. v.r.
,, *striatus*, Müll., v.r. d.
,, *pusio*, L., v.r. d.
Nucula nitida, G.B.S., r. l.
Diplodonta rotundata, Mont., v.r. l.
Leda minuta, Müll., f. d. r. l.
Axinus flexuosus, Mont., f. l.
Cardium edule, L., f. d.
,, *echinatum*, L., young, r. l.
Cyprina islandica, L., r., young, l, [valves, adult, f.
Astarte elliptica, Bro., one l.
Venus fasciata, da C., r. d.
,, *verrucosa*, L., r., young, l.
,, *lincta*, Pult., f. d.
,, *casina*, L., d.
Loripes lacteus, L., r. l.
Tellina crassa, Penn, v.r. d.
Scrobicularia alba (Wood), r. l.
,, *tenuis*, Mont., r. ? l.
,, *prismatica*, Mont., f. l.
Solen ensis, L., v.r. d.
Solen pellucidus, Penn., f. l.
,, *siliqua*, L., v.r. d.
Thracia prœtenuis, Pult., v.r. l.
,, *papyracea*, Poli., r.
Corbula gibba, Olivi., v.r. d.
Saxicava rugosa, L., f. l.
Trochus umbilicatus, Mont., v.r. d.
Turritella terebra, L., r. l.
Eulima polita, L., v.r. l.
Natica alderi, Forb., r. l.
Aporrhaïs pes pelicani, L., v.r. l.
Buccinum undatum, L , v.r. l.
Trophon muricatus, Mont., one l.
Fusus antiquus, L., v.r. l.
Pleurotoma turricula, Mont., v.r. d.
Utriculus mamillatus, Phil., r. l.
Cylichna cylindracea, Penn, f. l.
,, *umbilicata*, Mont., r. l.
Actæon tornatilis, L., v.r. d.
Philine scabra, Müll., r. l.
Tritonia Hombergi, Cuv., one l.
Dentalium entalis, L., f. l.
,, *tarentinum*, Lmk., r. l.
Sepia officinalis, L., one l.

CRUSTACEA.

Portunus depurator (L.), two l.
Hyas araneus (L.), one l.
,, *coarctatus*, Leach, r. l.
Ebalia pennanti (Leach), one l.
Eupagurus bernhàrdus (L.), r.
Galathea nexa, Emb., one l.
Cuma scorpioides (Mont.), f. l.
Parathemisto oblivia (Kr.), fr.
Thysanoessa, sp? fr.
Altentha, sp? r.
Acartia, sp? r.
Calisoma crenata (Bate), f.
Nephrops norvegicus (L.), f. l.
Balanus balanoides, L., f. l.
,, *hameri*, Ascan., r. l.
Hyperoche tauriformis (Bate), r.
Parathylus, sp? r.
Calagus rapax, M. Edw., fr.
Metopa, sp? r.
Calanus finmarchicus, c.

ECHINODERMATA.

Echinus esculentus, L., v.r. l.
Spatangus purpureus, Müll, f., [young, l.
Asterias rubens, L., f. l.
Henricia sanguinolenta, (O.F.M.), r. l.
Ophiura albida, Forbes, r. l.
,, *ciliaris*, L., f. l.
Ophiothrix fragilis, Abild., r. l.
Amphiura filiformis (O.F.M.), f. l.

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VERMES.

Pontobdella muricata, L., r. l.
Sagitta bipennata, Q. and G., c. l.
Aphrodite aculeata, L., f. l.
Polynoe imbricata, L., r. l.
Nereis pelagica, L., r. l.
,, *virens*, Sars., v.r. l.
Sabellaria alveolata, L., few colonies.
Pectinaria belgica, Pall., f. l.
Sabella pavonia, Sav., f. l.
Tomopteris onisciformis, Esch., fr.
Membranipora membranacea, L., r. l.
Gemellaria loricata, L., fr. l.

And several other Annelids not identified, l.

ACTINOZOA AND HYDROZOA.

Actinoloba dianthus, Ell., f. l.
Alcyonium digitatum, L., r. l.
Vergularia variabilis, Lamk., f. l.
Ctenophora, fr.
Sertularia abietina, L., r. l.
,, *argentea*, E. and Sol., [vr. l.
Diphasia pinaster, E. and Sol., v.r. l.

FORAMINIFERA.

Biloculina depressa, d'Orby, fr. l.
,, *ringens*, Lamk., v.r., l.
,, *oblonga*, Montag., f. l.
Miliolina tricarinata, d'Orby, v.r. l.
,, *seminulum*, L., c. l.
,, *oblonga*, Montag., r. l.
Spiroculina limbata, d'Orby, v.r. d.
Cornuspira foliacea, Philip, r. l.
,, *involvens*, Rss., v.r. d.
Astrorhiza limicola, Sandahl, r. l.
Psammosphæra fusca, Schz., r. l.
Reophax scorpiurus, Mont., abdt. l.
,, *Scotti*, Chaster, fr. l.
,, *fusiformis*, Will., f. l.
Haplophragmium canariensis, [d'Orby, r.
,, *pseudospirale*, [Will., c.
Ammodiscus gordialis, J. and P., [v.r.
,, *charoides*, J. and P., [v.r. l.
,, *incertus*, Brady, v.r. d.
Textularia gramen, d'Orby, f. l.
Spiroplecta sagittula, Defr., m. c. l.
Gaudryina filiformis, Ber., fr. l.
Verneuilina polystropha, Rss., fr.
Bulimina marginata, d'Orby, [m. c. l.
,, *aculeata*, d'Orby, r. l.
Bulimina elegans, d'Orby, v.r. d.
,, *inflata*, Sequ., v.r. d.
,, *elegantissima*, d'Orby, r. d.
Virgulina schreibersiana, Cz., v.r. l.
,, *subsquamosa*, d'Orby, [r. d.
,, *texturata*, d'Orby, v.r. l.
Bolivina punctata, d'Orby, v.r. l.
,, *robusta*, Brady, v.r.
,, *reticulata*, Hant., v. r.
Cassidulina crassa, d'Orby, v.r. l.
,, *subglobosa*, Brady, one.
Lagena distoma, P. and J., f. d.
,, *sulcata*, W. and J., m. c. l.
,, *striata*, d'Orby, r. l.
,, *gracillima*, Segu., r. l.
,, *lævis*, Montag., f. l.
,, *semistriata*, Will., f. l.
,, *globosa*, Mont., r. l.
,, *fimbriata*, Brady, v.r. l.
,, *alveolata*, Brady, v.r.
,, *marginata*, W. and B., r. l.
,, *quadricostulata*, Rss., v.r.
,, *globosa*, var., r. l.
,, *lævis* var. Montag., r. l.
,, *squamosa*, Mont., r. l.
,, *plumigera* var., v.r.
Nodosaria scalaris, Batsch, v.r. l.
,, *filiformis*, v.r. l.
,, *pyrula*, d'Orby, r. l.

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Nodosaria communis, d'Orby, r. d.
Cristellaria gibba, d'Orby, v.r. l.
,, *articulata*, one d.
,, *convergens*, Born., one d.
Polymorphina augusta, Egger., v.r. l.
,, *communis*, d'Orby, [v.r. l.
,, *elegantissima*, P. and J., one l.
,, *lanceolata*, Rss., v.r. l.
,, *lactea*, W. and J., [v.r. d.
Globigerina bulloides, d'Orby, r. d.
,, "*cretacea*-like form, [d'Orby,"* f. d.
Patellina corrugata, Will., r. l.
Discorbina globularis, d'Orby, r. l.
Discorbina orbicularis, Terq., f. l.
,, *tuberculata*, B. and W. [v.r. l.
,, *rosacea*, d'Orby, f. l.
Planorbulina mediterraniensis, [d'Orby, v.r. l.
Truncatulina lobatula, W. and J., [v.r. l.
Rotalia beccarii, L., abdt. l.
Gypsina inhærens, Schul., v.r. l.
Nonionina turgidæ, Will., f. l.
,, *scapha*, F. and M., r. l.
,, *depressula*, v.r. d.
Operculina ammonoides, Gron., f. l.
Polystomella striato-punctata, F. [and M., r. l.
,, *subnodosa*, v.r. l.

Station IX.—29-38 fathoms.

Pisces.

Cottus scorpius, L., v.r.
Trigla gurnardus, L., fr.
Lophius piscatorius, L., r.
Anarrhichus lupus, L., r.
Liparis vulgaris, Flem., r.
Gadus morhua, L., f.
,, *æglefinus*, L., f.
,, *merlangus*, L., f.
Pleuronectes platessa, L., f.
,, *microcephalus*, Don., f.
Pleuronectes cynoglossus, L., f.
,, *limanda*, L., f.
Hippoglossoides limandoides, Bloch., f.
Arnoglossus megostoma, Don., f.
Clupea harangus, L., f.
,, *sprattus*, L., f.
Acanthias vulgaris, Risso, one.
Raia radiata, Don., r.
,, *clavata*, L., f.
,, *batis*, L., f.

Tunicata.

Acidiella virginea, O.F.M., r. l.
Ascidia mentula, O.F.M., r. l.
Styelopsis glossularia, V. Ben., m. c. l.
Eugyra glutinans, Möll., r. l.

Mollusca.

Anomia ephippium, L., r. l.
Pecten opercularis, L., valves, r.
,, *pusio*, L., v.r. l.
,, *striatus*, Müll., r. l., valves, f.
,, *varius*, L., v.r. l.
Mytilus modiolus, L., one l.
Modiolaria marmorata, Forb., f. l.
Nucula nitida, G.B.S., f. l.
Leda minuta, Müll., f. l.
Montacuta substriata, Mont., v.r. l.
Loripes lacteus, L., f. l.
Axinus flexuosus, Mont., f. l.
Diplodonta rotundata, Mont., v.r. d.
Cardium echinatum, L., f. l.
,, *nodosum*, Turt., v.r. l.
Cyprina islandica, L., r. l.

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* This form is a variety of *G. bulloides*, resembling very closely *G. cretacea* described by d'Orbigny, Mém. Soc. Géol., France.

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Venus faciata, Da. C., v.r. l.
,, *casina*, L., v.r. l.
Tellina pusilla, Phil., v.r. l.
,, *balthica*, L., r. d.
Scrobicularia alba (Wood), m. c. l.
,, *prismatica*, Mont., r. l.
,, *tenuis*, Mont., v.r. l.
Solen pellucidus, Penn., f. l.
Thracia prætenuis, Pult., r. l.
,, *papyracea*, Poli., v.r. l.
Corbula gibba, Olivi., f. l.
Saxicava rugosa, L., r. l.
Pholas dactylus, valves, v. r.
Mya arenaria, L., valves, v.r.
Neaera cuspidata, one l.
Xylophaga dorsalis, c., in dead wood.
Dentalium entalis, L., f. l.
,, *tarentinum*, Lmk., v.r. l.
Chiton marginatus, Penn., r. l.
,, *ruber*, Lowe, f. l.
Emarginula fissura, L., one l.
Trochus tumidus, Mont., f. l.
,, *umbilicatus*, Mont., v.r. d.
,, *magus*, L., v.r. d.
Rissoa costata, Ad., v.r. l.
,, *punctura*, Mont., v.r. l.
Cæcum trachea, Mont., r. l.
Turritella terebra, L., f. l.
,, ,, var. *nivea*, Jeff., [r. l.
Odostomia rufa, Phil., v.r. d.
Eulima polita, L., r. l.
,, *bilineata*, Ald., one l.
Natica montacuti, Forb., v.r. l.
,, *alderi*, Forb., r. l.
Aporrhaïs pes pelicani, L., r. l.
Buccinum undatum, L., f. l.
Fusus antiquus, L., r. l.
,, *gracilis*, Da. C., r. l.
,, *propinquus*, Ald.
Nassa reticulata, L., r. d.
,, *incrassata*, Str., v.r. d.
Velutina lævigata, Penn., r. d.
Pleurotoma turricula, Mont., r. d.
,, *striolata*, v.r. d.
Defrancia linearis, Mont., r. l.
Cylichna cylindracea, Penn., f. l.
,, *umbilicata*, Mont., r. l.
Utriculus mamillatus, Phil., r. l.
Philine scabra, Müll., r. l.
,, *catena*, Mont., r. l.
Tritonia hombergi, Cuv., v.r. l.
Loligo vulgaris, Lenz., one l.
,, *media*, L., one l.

Crustacea.

Cancer pagurus, L., r. l.
Portunus holsatus, Fabr., r. l.
,, *depurator* (L.), f. l.
Hyas coarctatus, Leach, r. l.
,, *araneus* (L.), one l.
Stenorhynchus rostratus (L.), r. l.
Eupagurus pubescens (Kroy), f. l.
,, *cuanensis* (Thomp.), [v.r. l.
,, *bernhardus* (L.), r. l.
Nephrops norvegicus (L.), f. l.
Pandalus montagui, Leach, f. l.
Crangon allmani, Kin., f. l.
Pseudocuma cercaria, f. l.
Cuma scorpioides (Mont.), f. l.
Caprella linearis (L.), f. l.
Arcturus longicornis (Low), r. l.
Callisoma crenata (Bate), f. l.
Neomysis vulgaris (Thomp.), f. l.
Thysanoesea, sp?
Parathemisto oblivia (Kr.), r. l.
Calliopsis bidentata (Kr.), fr. l.
Nyphon gallicum, Hoek., *one l.*
Hyperoche tauriformis (Bate), r. l.
Erythrops Goesii, G. O. Sars., r. l.
Cleone borealis, v.r. l.
Paratylus, sp?
Leucon nasicus (Kroyer), f. l.
Calanus finmarchicus (Gunn), c. l.
Temora longicornis, Müll., fr. l.
Pseudocalanus elongatus, Baird, r. l.
Caligus rapax, M. Edw., f. l.
Ampelisca brevicornis, Costa, f. l.
Balanus balanoides, L., r. d.
,, *porcatus*, Costa, f. l.
Peltogaster paguri (Rathk), r. on [*Eupagurus bernhardus*, r. l.

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VERMES.

Sipunculus bernhardus? r. l.
Aphrodite aculeata, L., r. l.
Pectinaria belgica, Pall., f. l.
Sabella pavonia, Sav., f. l.
Serpula vermicularis, Ellis, f. l.
,, *triquetra*, L., f. l.
Filigrana implexa, Berk., r. l., [colonies.
Tomopteris onisciformis, Esch., f. l.
Sagitta bipunctata, Q. and G., m. c.
Flustra securifronds, Pall.
Membranipora pilosa, L., m. c.
,, *membranacea*, L., r. l.
Gemellaria loricata, L., r. l.
Cellaria sinuosa, Hass., r. l.
Crisia eburnea, L., r. l.
Diastopora obelia, Johnt., v.r. l.
Alcyonidium parasiticum, Flem., m. c.
Mucronella variolosa, Johnt., v.r. l.

ECHINODERMATA.

Spatangus purpureus, Müll., r. l.
Solaster papposus, Fabr., r. l.
Ophiura ciliaris, L., v.r. l.
Amphiura filiformis, O.F.M., r. l.
Ophiothrix fragilis, Abild., f. l.
Echinocardium flavescens, O.F.M., [f., young, l.
Asterias rubens, L., v.r. l.
Ophiura albida, Forb., f. l.
Henricia sanguinolenta, O.F.M., r. l.
Luidia sarsii, Dub. and Kor., one, l.

ACTINOZOA AND HYDROZOA.

Actinoloba dianthus, Ellis, r. l.
Rhizastoma, sp, r. l.
Heterocordyle Conybearei, f., c. on [d. Aporrhaïs shells.
Hydrallmania falcata, L., v.r. l.
Sertularia abietina, L., v.r. l.
Sertularia argentea, E. and S., r. l.
Virgularia mirabilis, Lamk., f. l.
Ctenophora, f. l.
Eudendium ramosum, Pallas, f. l.
Antennularia antennina, L., v.r. l.
Diphasia pinaster, E. and S., r. l.
Plumularia pinnata, L., r. l.

PORIFERA.

Suberites ficus, Johnston, v.r. l.
Chalina? sp? several l.

FORAMINIFERA.

Nubecularia lucifuga, Defr., v.r. l.
Biloculina ringens, Lamk., m. c. l.
,, *depressa*, d'Orby, f. l.
,, *elongata*, d'Orby, r. l.
Spiroculina limbata, d'Orby, f. l.
,, *excavata*, d'Orby, v.r. l.
Miliolina seminulum, L., c. l.
,, *circularis*, Born.
,, *oblonga*, Montag., f. l.
,, *trigonula*, Lamk., r. l.
,, *venusta*, Karr., v.r. l.
Miliolina tricarinata, d'Orby, v.r. l.
,, *boueana*, d'Orby, r. l.
,, *secans*, d'Orby, r. l.
,, *contorta*, d'Orby, v.r. l.
,, *agglutinans*, d'Orby, [v.r. l.
Ophthalmidium inconstans, Brady, [f. l.
Cornuspira involvens, Rss., f. l.
,, *foliacea*, Philip, r. l.
Astrorhiza limicola (Sandahl), r. l.

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Psammosphæra fusca, Schz., f. l.
Hyperammina arborescens, Norm., [f. l.
Reophax scorpiurus, Montf., c. l.
,, *Scotti*, Chaster, f. l.
,, *fusiformis*, Will., f. l.
Haplophragmium canariensis, [d'Orby, c. l.
,, *glomeratum*, [Brady, c. l.
,, *pseudo-spirale*, [Will., f. l.
Ammodiscus gordialis, P. and J., [v.r. l.
,, *charoides*, P. and J., [v.r. l.
,, *incertus*, d'Orby, v.r. l.
Trochammina inflata, Montf., r. l.
,, *ochracea*, Will., f. l.
Textularia gramen, d'Orby, f. l.
,, *agglutinans*, d'Orby, f. l.
Spiroplecta sagittula, Defr., c. l.
Gaudryina filiformis, Berth., [m. c. l.
Verneuilina polystropha, Rss., f. l.
Bulimina elongata, d'Orby, r. l.
,, *marginata*, d'Orby, f. l.
,, *aculeata*, d'Orby, r. l.
,, *elegans*, d'Orby, r. l.
,, *elegantissima*, d'Orby, f. l.
,, *inflata*, Sequ., f. l.
,, *fusiformis*, Will., f. l.
Virgulina schreibersiana, Cziz., [m. c. l.
,, *squamosa*, d'Orby, f. l.
,, *texturata*, f. l.
Bolivina punctata, d'Orby, f. l.
,, *plicata*, d'Orby, f. l.
,, *robusta*, Brady, v.r. l.
,, *reticulata*, Hartken, f. l.
,, *lævigata*, Will., v.r. l.
Cassidulina crassa, d'Orby, f. l.
,, *lævigata*, d'Orby, v.r. l.
Lagena sulcata, W. and J., f. l.
,, *interrupta*, Will., v.r. l.
,, *costata*, Will., f. l.
,, *distoma*, P. and J., v.r. l.
Lagena striata, d'Orby, f. l.
,, *gracillima*, Segu., f. l.
,, *fimbriata*, Brady, v.r. l.
,, *lævis*, Mont., m. c. l.
,, *lævis* var., f. l.
,, *globosa*, Mont., f. l.
,, *globosa* var., v.r. l.
,, *marginata*, W. and B., v.r. l.
,, *alveolata*, Brady, r. l.
,, *quadricostulata*, Wr., v.r. l.
,, *pulchella*, Brady, v.r. l.
,, *squamosa*, Mont., r. l.
,, *lævigata*, Rss., f. l.
,, *tenuistriata*, Brady, r. l.
,, *distoma* var., P. and J., [v.r. l.
,, *orbignyana*, Seg., r. l.
,, *trigono-marginata*, P. and [J., v.r. l.
Nodosaria communis, d'Orby, f. l.
,, *pyrula*, d'Orby, f. l.
,, *scalaris*, Bate, r. l.
,, *filiformis*, L., r. l.
Cristellaria rotulata, Lamk., v.r. l.
,, *gibba*, d'Orby, f. l.
,, *cultrata*, Montf., f. l.
,, *articulata*, Reuss, l.
Polymorphina lactea, W. and J., [v.r. l.
,, *augusta*, v.r., l.
,, *communis*, d'Orby, r. l.
,, *compressa*, d'Orby, r. l.
,, *lanceolata*, Rss., r. l.
,, *elegantissima*, P. and J., [v.r.
Uvigerina angulosa, Will., v.r. l.
,, *pygmæa*, d'Orby, one d.
Globigerina bulloides, d'Orby, f. d.
,, *triloba*, Rss., f. d.
,, *cretacea*-like form, d'Orby, [f. d.
Spirillina limbata, Brady, r. l.
Patellina corrugata, Will., r. l.
Discorbina rosacea, d'Orby, f. l.
,, *ochracea*, Will., r. l.
,, *globularis*, d'Orby, f. l.
,, *orbicularis*, d'Orby, f. l.

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Planorbulina mediterraniensis, [d'Orby, f. l.
Truncatulina lobatula, W. and J., r. l.
,, *lobatula* var., W. and [J., f. l.
Pulvinulina Karsteni, Rss., r. l.
Rotalia beccarii, L., abdt. l.
,, *nitida*, Will., f. l.
Gypsina inhærens, Schul., v.r. l.
Nonionina turgida, Will., f. l.
,, *scapha*, F. and M., f. l.
,, *depressula*, W. and J., [v.r. l.
,, *stelligera*, d'Orby, v.r. l.
Operculina ammonoides, Gron., f. l.
Polystomella striato-punctata, F. [and M., f. l.
,, *subnodosa*, r. l.

MARINE DEPOSITS AND THEIR BEARING ON MARINE LIFE.

It is possible by careful examination of most marine deposits to determine very closely what kind and amount of marine life is likely to be found in any given area over the sea floor.

It has, therefore, often occurred to me that an examination of the marine deposits round our coasts, and over the areas of our great fishing grounds and banks, would greatly assist in throwing light upon the question as to the cause of the destruction of marine life, the movements and depopulation of fish from our inshore fishing grounds, banks, and estuarian waters, which, it is well known, were at one time thickly populated with abundance of marketable fish, but are at the present time, in some localities, scarcely worth the fishing.

Under ordinary natural conditions, animal life is usually found plentifully distributed all over these areas, but I have to record here that, so far as the Firth of Forth is concerned, a change of conditions has taken place which is undoubtedly detrimental to the marine life generally.

By examination of the deposits and general condition of the ground in these localities, a key to this question is, in my opinion, possible to be found. To carry this out, it is necessary to keep in mind the following chief points:—

1. The geographical features and position of the area to be considered.
2. The physical conditions; the amount, condition, and number of species of animals found living on the sea floor; and in the deposits themselves.
3. The age of the deposits, rate of accumulation, their permanency, and in what measure they are affected by wave action and currents.

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4. The amount of detrital and other matter brought to and deposited over these areas from rivers, general land drainage, and disintegration of the coast line.
5. The amount of material deposited from steam-ships, dredgers, and sewage, or solid matter in suspension.

Or one might put the question in two words—are the deposits *clean* or *polluted?* Upon the greater or less degree the grounds are affected by these agencies, will the destruction of the bottom-living and pelagic animals and movements of the fish be regulated.

The Firth of Forth may, perhaps, be taken as a more or less typical example. Not many years past in this area marketable fish were to be taken in plenty, while we know at the present time comparatively few can be captured either by trawl, line, or other appliances. Continuous trawling would, doubtless, in such a restricted area, soon clear it of fish for a time, but if left undisturbed for a reasonable time, there can be little doubt that it would become repopulated were the surrounding conditions favourable, which is the case where ordinary natural conditions of the sea are not disturbed or polluted. It will not be disputed that where the water is pure and the deposits not continually disturbed or polluted, everywhere at a reasonable depth, from the tidal line downwards over the sea floor, marine life is abundant, and that the lower animals furnish the chief food of the higher forms.

The examination of the deposits found in the area under consideration, and described in these notes, indicate fully that the conditions are not favourable to the attraction and necessary support of marine life, especially of any large quantity of fish whose chief food consists of invertebrate animals which live in and on the deposits over its floor. Not many years past there was to be found living, generally distributed over the floor of the Firth of Forth, patches or banks of considerable extent, covered thickly with living *Pecten opercularis*, L. ("clam" of the fishermen); *Turritella terebra*, L. (a long, conical, univalve Mollusc); *Ostrea edulis*, L. (oyster); *Mytilus edulis*, L. (the common mussel); *Buccinum undatum*, L. (buckie); and other Mollusca, with abundance of many species of invertebrate animals, as CRUSTACEA, ANNELIDS, ECHINODERMS, HYDROZOA, &c., &c., "fish food." At

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present, however, comparatively few of the latter, and nothing like the quantity of the former species are to be found living. The deposits, on the other hand, are full of their dead remains, the dredge often bringing up huge quantities at each haul.

The "Clam," "Oyster," "Mussel," and *Turritella* beds have greatly diminished in size. They are, in some places, entirely destroyed, and are only now to be had in comparatively small quantities in a few more or less favourable localities, namely:—About the North Craig Buoy, off Cockenzie, Prestonpans, and a few here and there on and near the edges of the Middle Bank. That the marine life generally on the floor of the Firth of Forth has been gradually killed off appears evident. The greater portion of the area within 3 or 4 miles west from the May Island, as seen by the examination of the deposits, reminds one more of a huge burial-ground, so numerous are the quantity of the bones, "so to speak," of the marine organisms one finds in them.

In working over the district, the struggle for existence is strikingly illustrated by the difference in the number of living animals captured. The nearer one approaches the mouth of the Firth from Inchkeith, gradually the various forms of marine life (especially the lower forms) increase in number and species, as will be seen by reference to the lists accompanying these notes of the animals obtained at each of the special observing stations (see Chart). Taking Stations I. and IX., for example, we find at Station I., at a depth of 10 to 18 fathoms, 1 to 5 miles east of Inchkeith, the following result:—

Name of Group.	No. of Species obtained.	No. of Species obtained living.	No. of Species obtained dead.	No. of bottom-living Species.	No. of Species which lead a pelagic life.	No. of Species found living on the bottom at the time of observation.
Fish, . .	14	14	...	8	6	6
Tunicates, .	1	1	...	1.	...	1
Mollusca, . .	23	1	22	23	...	1
Crustacea, .	18	18	...	8	10	5
Vermes, . .	19	12	7	17	2	10
Actinozoa and Hydrozoa,	8	8	...	6	2	6
Foraminifera, .	32	6	26	32	...	6
Total, .	115	60	55	95	20	35

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At Station IX., at a depth of 29 to 35 fathoms, 5 to 10 miles south-east of the May Island :—

Name of Group.	No. of Species obtained.	No, of Species obtained living.	No. of Species obtained dead.	No. of bottom-living Species.	No. of Species which lead a pelagic life.	No. of Species found living on the bottom at the time of observation.
Fish, . .	20	20	...	13	7	7
Tunicates, .	4	4	...	4	...	4
Mollusca, . .	69	64	5	69	...	64
Crustacea, .	35	34	1	19	16	18
Vermes, . .	28	27	1	26	2	27
Actinozoa and Hydrozoa,	12	12	...	10	2	10
Porifera, . .	2	2	...	2	...	2
Foraminifera, .	115	112	3	112	3	112
Total, .	285	275	10	255	30	244

From the above Tables it will be seen that the number of different species of animals obtained at Station I. is altogether 115. Twenty of these lead a truly pelagic life; 95 live on the bottom or in the deposit itself. Of these 55 were dead, leaving only 35 species living.

At Station IX., near the mouth of the Firth, we find quite a different state of matters. Here we have in all 285 species, 30 pelagic and 255 bottom-living forms. Of these, only 10 were found dead, less than 5 per cent.; while 244 species were found living on the bottom at the time these observations were made, against 55 species obtained at Station I.* So far as my investigations have extended, I have not been able to find any quantity of pelagic life that might be termed permanent local "Plankton," as is to be found in other similar localities, *i.e.*, Clyde estuary and Loch Fyne, &c. These organisms would appear to be chiefly regulated in this case by tidal influences, shallowness of

* It should be mentioned here that the Ostracoda have been omitted, as I have not yet been able to identify them all. They would, however, not alter the total results materially. The fish stated to be living on the bottom in Column 5 have been placed in this Column, as they are true bottom feeders, and do not lead a truly pelagic life.

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the Firth, and purity of its waters, at different seasons of the year, by the greater or less amount of detrital and solid matter in suspension.

These pelagic organisms are usually, under ordinary circumstances, in such quantities that vast numbers of them are constantly dying off with the ever-changing physical and developmental conditions in the surface and sub-surface waters; their remains, sinking to the bottom, carry down with them quantities of organic material, forming one of the chief factors from which many of the bottom-living animals derive their food supply. The want of this constant supply in the Firth of Forth would be disastrous to their existence.

That a great destruction of many of the more important forms of marine life on the floor of the Firth of Forth has taken place there can be no doubt. In the case of the *Oyster*, *Clam*, and *Mussel* it has been well known for some time. To account for this serious destruction many causes have been put forward from time to time. The most likely may be mentioned here:—(1) reckless fishing; (2) deposition of peat, &c., brought down the Forth from its upper reaches by currents; (3) deposition of mud, &c., from harbour dredgers; (4) pollution from oil and other factories situated along its shores; (5) changes in the seasons; (6) the throwing over of ashes and "clinker" from steamers. With the exception of the first, perhaps, all the causes above mentioned are strikingly illustrated by the examination of the deposits found all over the area between Inchkeith and May Island. Not one of the samples examined by me can be said to be free from one or other of these polluting substances.

It is also true that during the winter months and early spring the waters of the Forth often become heavily laden with fine argillaceous matter in suspension. A large amount of dredged material from harbours have been and are still deposited in this area. The number of steam-ships entering and leaving the Firth have greatly increased, and are answerable for many thousands of tons of material in the form of ashes, "clinker," &c., indiscriminately thrown overboard and distributed over its floor. An increase of sewage and other detrital matter constantly enters its waters. This, with any sudden extra large amount of argillaceous matter brought down by the rivers and general land

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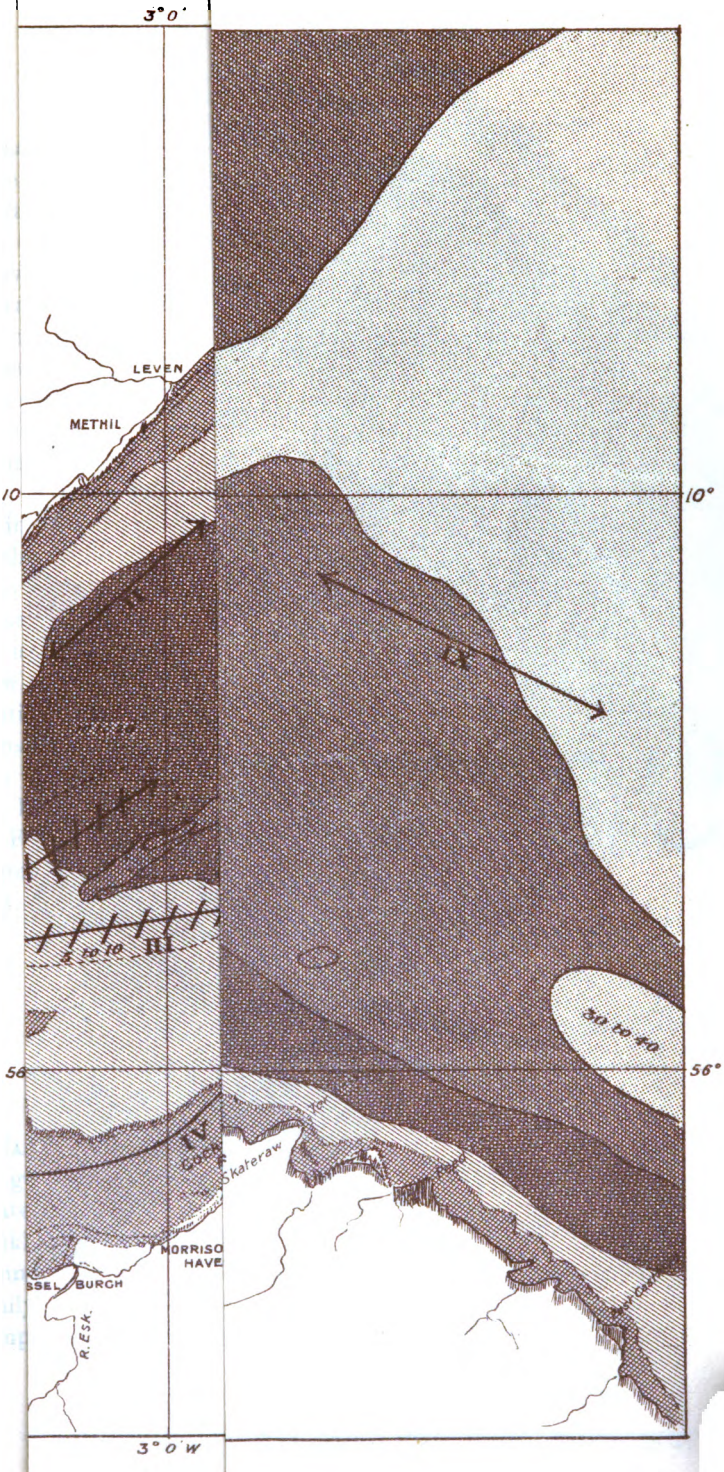

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drainage—which at times takes place during westerly and south-westerly gales, with heavy rain—on sinking to the bottom, forms layers of fine mud, from a $\frac{1}{8}$ to 1 inch in thickness, over a large area of its surface, and is traceable out to the extreme limits. Many of the dead and living animals brought up by the dredge or trawl often showed distinctly a thin coating of this material, which mostly resembles river mud. Further investigation is necessary to determine the exact quantity of the solid matter in suspension, and would be of great importance in determining decisively as to whether the introduction of so much solid and detrital matter is the true cause of the destruction of the marine life. It is quite probable that it chokes off great quantities of the invertebrate animals mentioned as inhabiting the floor of the Forth, and in the deposits themselves, causing them to become, as I have said, polluted and unfit for the maintenance and existence of marine life, causing the destruction of the feeding grounds, and migration of the fish. Hence it is to the more open waters, or where the deposits are *clean*, that such agencies above mentioned cannot affect them to such a degree, that we may, by reasonable methods, expect a constant and plentiful supply of both vertebrate and invertebrate marine life.

Further and systematic investigations on this subject in the Firth of Forth and other localities is necessary, and would be of great interest and importance in discussing these matters more fully.

Reports on Excursions.

Camis Eskan, 1st September, 1900.—A party of fifteen, under the guidance of Mr. D. R. Somerville, visited this old residential estate on a fine afternoon. The estate of Colgrain, together with Meikle and Little Camis Eskan, belonged to the family of Dennistouns before 1377, and continued in possession of the family for nearly 500 years. In 1836 it was sold to Mr. Colin Campbell, third son of Mr. John Campbell of Morreston,

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Lanarkshire. There was a chapel dedicated to St. Blane, erected on the lands by an early laird of Colgrain, but no trace of it remains. The mansion is well situated in wooded grounds. On a stone in the older part of the house are cut the letters and date 16 ID. IS. 48. These are evidently the initials of the eleventh laird, John Dennistoun, and of his wife Jean Sempill, daughter of William Sempill of Fulwood, who were married 15th February, 1648. John Dennistoun was an active Royalist, and died in 1655 of wounds received in an attempted rising in the Highlands in the previous year.

The only plant of special interest observed was the Twayblade, *Listera ovata*, R. Br. Attention was directed principally to the trees, among which were some very fine specimens of silver fir, walnut, elm, and sycamore. Mr. Renwick and Mr. M'Kay made the following measurements of trees:—

Silver Fir, below house, on side of avenue—
11 ft. 2½ins. at 5 ft. side next avenue.

Sycamore, to south east of house—
14 ft. 2¾ ins. at 5 ft. next avenue, bole 14 ft.

Elm, to south west of house—
14 ft. 10 ins. at 4 ft. 10 ins.; bole 8½ ft.; height 81 ft.; spread, N.E. to S.W., 90 feet.

Walnut, to south of house—
9 ft. 3½ ins. at 5 ft.; bole 11 ft.

Silver Fir, on side of burn above house—
13 ft. 1 in. at 5 ft.

Silver Fir, farther up burn—
13 ft. 7 ins. at 5 ft. = 7 ft. 1 in. above walk.

Silver Fir, still farther up—
12 ft. 11¼ ins. at 5 ft. next avenue.

Mr. Wm. Stewart has drawn up the following list of 27 Fungi and 8 Ferns obtained at Camis Eskan:—

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Fungi.

Ag. phalloides, Fr.
,, *rubescens*, Pers.
,, *vaginatus*, Bull.
,, *cristatus*, A. & S.
,, *papilionaceus*, Fr.
,, *radicatus*, Rehl.
,, *laccatus*, Scop.
,, *virgatus*, Fr.
,, *geophyllus*, Sow.
,, *calolepis*, Fr.
Lactarius blennius, Fr.
,, *quietus*, Fr.
,, *vellereus*, Fr.
,, *hysginus*, Fr.
Russula fellea, Fr.
,, *emetica*, Fr.
,, *nigricans*, Fr.
,, *cyanoxantha*, Fr.
Hygrophorus psittacinus, Fr.

Fungi.

Hygrophorus calyptræformis, B. & Br.
,, *virgineus*, Fr.
,, *chlorophanus*, Fr.
Marasmius peronatus, Fr.
,, *porreus*, Fr.
Cantharellus cibarius, Fr.
Boletus flavus, With.
Lycoperdon pyriforme, Schæff.

Ferns.

Athyrium Filix-fœmina Bernh.
Lastrea Filix-mas, Rich.
,, *dilatata*, Desv.
,, *Oreopteris*, Desv.
Polystichum aculeatum, Sw.
,, form *lobatum*, Sw.
Polypodium vulgare, L.
Pteris aquilina, L.

Douglas Support, 15th September, 1900.—Mr. William Stewart, the conductor of this excursion, reports that the fungi were remarkably scarce even in very suitable ground, but that the following species were obtained :—

Ag. (*Amanita*) *rubescens*, Pers.
,, (*Clitocybe*) *laccatus*, Scop.
,, (*Collybia*) *radicatus*, Rehl.
,, (*Inocybe*) *rimosus*, Bull.
,, (*Hypholoma*) *velutinus*, Pers.
Coprinus micaceus, Fr.
Lactarius blennius, Fr.
,, *serifluus*, Fr.
Russula nigricans, Fr.
,, *fellea*, Fr.
,, *ochroleuca*, Fr.
Clavaria cinerea, Bull.

Mr. Renwick and Mr. M'Kay measured the following trees :—

Hornbeam, 8 ft. 1½ ins. at 5 ft. S.W; bole, 17 ft; spread, 60 ft; height, 78 ft.

Hornbeam, 7 ft. 6¼ ins. at 5 ft.; bole 18 ft.

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Beech, E. of four, 12 ft. 9 ins. at 5 ft. next bridge.

Beech, N. of four, 13 ft 10 ins. at 5 ft. next river; bole, 35 ft.; height, 89 ft.

Beech, W. of four, 14 ft. 0½ in. at 5 ft. N.

Beech, S. of four (near stone bridge), 12 ft. 6½ ins. at 5 ft. next bridge; bole, 32 ft.

Beech, to S. of suspension bridge, 14 ft. 9 ins. at 5 ft.; bole, 40 ft.

Beech, one of a pair on haugh between house and river, 12 ft. 2 inches at 5 ft.; bole, 30 ft.

Beech, the other of pair, 11 ft. 7½ ins. at 5 ft.; bole, 18 ft.; height, 88 ft.

BUCHANAN CASTLE, 24th September, 1900 (Glasgow Autumn Holiday).—Mr. John Renwick reported on this excursion, as follows:—

"The party went by rail *via* Balloch to Drymen Station, walking thence to the village of Drymen, fully a mile and a-half distant. The first part of the road, from the station to near the River Endrick, was a turnpike road leading to Glasgow by Easter Kilpatrick, made towards the close of last century. In the Statistical Account of Kilmaronock Parish, written about 1792, it is stated to be 'now nearly completed.' Near Catter House, it joins the military road from Dumbarton to Stirling, which crosses the Endrick 'by an excellent modern bridge,' and passes from the Parish of Kilmaronock, in Dumbartonshire, to that of Drymen, in Stirlingshire. From the townhead of Drymen, a road leads past the Parish Church of Buchanan to Balmaha, and onward, near the shores of Loch Lomond, to Rowardennan. It was completed about 1790, after about thirty years' slow work. The policies of Buchanan lie on the sloping ground between this road and the River Endrick, which winds in many a link among the haughs laid down by itself when the land lay at a lower level than now. The writer of the Statistical Account of Buchanan Parish says 'This river, in the winter season, when the loch is full, covers a

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great part of the lower grounds on both sides of the parishes of Buchanan and Kilmaronock, and when the water lies dead and goes off gradually, it enriches the ground; but the floods have often proved hurtful in the spring, after the seed was sown, and oftener in harvest, both before the corns were cut down, and afterwards, carrying some away, and greatly damaging the rest. In harvest, 1782, in a flood, the haughs of Endric in this parish were covered with water, and immediately after there came snow and ice, so that in some places people walked on the ice above the standing corn.'

"Buchanan belongs to the Duke of Montrose, but for seven centuries it was the property of the Buchanans of that ilk. The direct line of the old family became extinct in 1682, when John Buchanan, the 22nd laird, died. The estate was then purchased by the third Marquis, who afterwards became the first Duke, of Montrose.

"The policies are of considerable extent, about two and a-half miles in length by fully a mile in breadth, and are well wooded. Mr. Crosbie, the gardener, stated that, from the sheltered situation, Buchanan is more moist than are other localities farther north, on the side of Loch Lomond, and the trees are thus more covered with lichens and moss.

"Under this gentleman's guidance the party visited the hot-houses, the flower and fruit gardens, and the policies. In the gardens they were shown the original plant of the Buchanan Fern (*Athyrium Filix-fœmina*, var. *Victoriæ*, Moore). This fern was discovered by Mr. James Cosh in 1861 by the side of a wood on this estate, and was removed to the garden in 1863. Mr. Wm. Stewart states that it grows freely from spores, retaining perfectly its unique character, and is now in all the fern nurseries.

"Between the gardens and the castle are a number of very fine conifers. Nowhere in our excursions have we seen any specimen of the Menzies Spruce Fir (*Abies menziesii*, Loudoun), at all approaching one here, which rises to a height of 81 feet, has a spread of 49 feet, and a girth of 9 feet 1 inch at 5 feet up. A fine Noble Silver Fir (*Picea nobilis*, Loudoun), also attains a height of 81 feet, with a girth of 7 feet 9¼ inches at 5 feet. A Wellingtonia (*Sequoia gigantea*, Lindley), has a height of 71 feet, and a girth of 9 feet 3½ inches at 5 feet, 10 feet 9

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inches at 3 feet, and 13 feet 7¾ inches at 1 foot, thus exceeding in height the one seen on the Spring Holiday at Dalquharran, Ayrshire, and nearly rivalling it in girth. A Cedar of Mount Atlas (*Cedrus atlantica*, Manetti), girths 4 feet 11 inches at 5 feet. To the west of the castle is a very fine Yew (*Taxus baccata*, L.), a female tree. It has a girth of 11 feet 9¼ inches at 2 feet 9 inches on south side, a bole of 7½ feet, and a spread in one direction of 58¾ feet and in another of 55½ feet. But the most abundant conifer is the Douglas Spruce Fir (*Abies douglasii*, Lindl.), which forms quite a feature in the grounds. A plantation of 6 acres, planted about 1858, was pointed out. Two fine specimens near the old house were measured. One had a girth of 11 feet 8¼ inches at 5 feet. The other was even a more splendid tree, girthing 13 feet 2 inches at 5 feet, and attaining a height of 84½ feet. From inquiries which Mr. Crosbie has made, this grand tree appears to be about 72 years old.

"In former times the Oak (*Quercus robur*, L.), would seem to have been a feature of the woodlands of Buchanan Parish, which extends from the Endrick up Loch Lomond to opposite Ben Voirlich, thence to near the head of Glengyle, and includes part of Loch Katrine, Loch Arklet, and Ben Lomond. The writer of the (Old) Statistical Account, 1792, says 'Near the house of Buchanan there is an old Oak Wood, great additions have been made to which within these forty years past. The present Duke of Montrose is planting a great deal of different kinds of trees in the bottom of Buchanan. In the Island of Inchcailloch there is a large Oak Wood. From the Grampian Hills to the north end of the parish, along the side of the loch, is one continued wood, consisting of some Ashes, Alders, Hazels, but mostly Oaks.' In the New Statistical Account, drawn up February, 1838, and revised March, 1841, it is stated that 'in the parish there are many Oaks from 10 to 13 feet in circumference. One near Buchanan House, at the height of 5 feet from the ground, is 14 feet in circumference, and contains 200 feet of timber. Another Oak is 18 feet in girth near the surface, but immediately branches out into five stems called 'the Five Sisters of Buchanan.' These trees are supposed to be 500 years old.' The former tree had grown from 14 feet, about 1840, to 16 feet 8½ inches, in May, 1889, and to 17 feet 4¾ inches, in September, 1900. The rate of

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increase in the two terms of years is almost identical, ·67 of an inch yearly in the first, and ·69 of an inch in the second. The bole is short, dividing into two large stems at 7 feet up, but the tree is a tall one, rising to a height of 87 feet. The 'Five Sisters' tree, which was 18 feet near the surface about 1840, was 19 feet 3½ inches at 2 feet 4 inches from the ground in May, 1889, and 19 feet 6 inches at 2 feet 4 inches in September, 1900. The tree is decaying, and part of the stem has been broken off, otherwise the increase would have been greater than 2½ inches in twelve seasons. Another Oak measured 13 feet 6 inches in girth at 4 feet, with a bole of 8 feet.

"In the park west of the castle is a Spanish Chestnut (*Castanea sativa*, Mill.), girthing 18 feet 6 inches at 2 feet 6 inches. It divides at 8 feet from the ground into three large stems, and the bole is evidently breaking asunder into three. The trunk is covered with patches of lead. In May, 1889, the girth was 15 feet 9 inches at 2 feet 6 inches, and part of the apparent increase is evidently due to the trunk being forced asunder by the weight of the three divisions. Near the castle is a Spanish Chestnut planted by Charles Kean in 1865. It has a tapering bole of nearly 35 feet in length. In May, 1889, it had a girth at 2 feet 6 inches up of 2 feet 7½ inches, now it is 5 feet 5¼ inches, an increase of 2 feet 9¾ inches in 12 seasons, or at the rate of fully 2¾ inches yearly.

"A Birch (*Betula verrucosa*, Ehrh.), measured 7 feet 1¾ inches at 5 feet, with a bole of 12 feet.

"In the policies are the ruins of Our Lady Chapel, or the Chapel of St. Mary of Buchanan, which, wrote the late Mr. J. Guthrie Smith, 'are rapidly disappearing, being hid from view by shrubs and undergrowth. It was surrounded by a churchyard, and stands among very fine old trees, notably a magnificent Plane, a little to the north-west of the old house of Buchanan, not far from the present stable-yard. It lay east and west, and its site is still marked by stones, and still standing in the middle is what remains of a large stone font. There are several tombstones lying in and near the old church, but upon none of them is any inscription left.' The present minister of the parish has, we were told, had the font and some of the tombstones removed to the church. We measured the Plane (*Acer Pseudo-platanus*, L.),

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mentioned by Mr. Smith, and found it to girth 12 feet 7 inches at 7 feet 3 inches from the ground, with a good bole of 20 feet. The stem is curiously irregular, and a measurement at 5 feet would have given a much greater circumference. At an average of 1 foot from the ground it girths 18 feet 1 inch. Above 1 foot up it projects considerably on one side.

"According to the Statistical Account, the Parish of Buchanan was formerly called Inchcailloch, from the island of that name, where the church was until 1621, when a considerable part of the Parish of Luss, situated on the east side of Loch Lomond, was annexed to the Parish of Inchcailloch. Luss, however, had some lands added to it that formerly belonged to Inchcailloch. The church in the island having become dilapidated, and the people not finding it convenient to cross, especially in stormy weather, worship was performed in this chapel, which was formerly a chapel of ease belonging to the Parish of Luss. From this chapel of Buchanan the whole united parish came by degrees to be called the Parish of Buchanan.

"Mr. Anderson Fergusson found the following species of Coleoptera:—*Oxypoda alternans*, Grav.; *Autalia impressa*, Ol.; *Bolitobius trinotatus*, Er.; *Gyrophæna pulchella*, Heer., about twelve examples, all in decaying fungi.

"The last-named proved to be new to Scotland."

CADZOW, 27th April, 1901.—A party of about twenty, with Mr. James Murray as conductor, left Glasgow by the 2.21 p.m. train to Hamilton, and proceeded to Cadzow High Parks. On the way the maple trees at the entrance to Barncluith were noted to be in a healthy condition. Entering Cadzow, the whole party at first walked to the Old Castle, and thereafter dividing into companies, some went through the parks to get a better view of the famous white cattle, others, devoted rather to entomology, kept to the bed of the Avon, and a third party strolled down the glen. The weather was beautiful, and the excursion was much enjoyed. The following Diptera were collected by Mr. Alex. Ross:— *Dixa maculata*, Mg.; *Dicranomyia chorea*, Mg.; *Dactylolabis*, sp. (?); *Trichocera regelationis*, L.; *T. hiemalis*, Deg.; *Rhyphus fenestralis*, Mg.; *Scatophagus stercorarius*, L.

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The following trees were measured by Mr. Renwick and Mr. M'Kay:—

Sycamore at Barncluith gate—girth, 15 ft. 8¾ ins. at 4 ft. 8 ins., showing an increase in girth of 1¾ ins. in 3 years, or an average of ·58 in. yearly.

Sycamore, at Chatelherault—girth, 13 ft. 9½ ins. at 4 ft. 9 ins.; bole, 8 ft.

Oak, near Green Walk—girth, 21 ft. 9 ins. at 5 ft.; bole, 26 ft.

This tree is decaying at the extremities of the branches, the increase in girth in three years is only half-an-inch.

Oak, in High Parks—21 ft. 3 ins. at 3 ft. 6 ins.; bole, 7 ft.

Oak, at sheds in High Parks—girth, 15 ft. 5¾ ins. at 4 ft. 6 ins., showing an increase in girth of 2¼ ins. in three years, or an average of ·75 in. yearly.

Evergreen Holly Oak, at Chatelherault—girth, 3 ft. 3 ins. at 3 ft. 8 ins.; bole, 4 ft.

CASTLEMILK, RUTHERGLEN, 16th May, 1901.—Only six members joined in this evening excursion, the conductor being Mr. Thomas Boyle. The bedroom in the Castle, where it is reported that Mary Queen of Scots passed the night before the battle of Langside, was inspected, and thereafter the pond, garden, and greenhouses were visited.

CULZEAN CASTLE AND CROSSRAGUEL ABBEY, 23rd May, 1901 (Victoria Day).—This excursion, which was undertaken jointly with the Andersonian Naturalists' Society, was attended by fifty-two, the conductor being Mr. Hugh Boyd Watt, who contributed the following report:—

The route followed was from Maybole by road, and through the policies and gardens of Culzean, and back to Maybole by the Kirkoswald road.

Cameras were much in evidence, and a large number of photographs were taken.

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The policies were entered at the Pennyglen Gate, and the shade of the trees afforded welcome cover from the hot sun of one of the warmest days of this very fine month of May. So far as was observed, there were no woodland trees of remarkable size, but there is a great variety of introduced trees, shrubs, and herbs. Mr. Dale, the forester, who acted as guide, said that he understood that the grounds had been planted about 120 years ago by a Mr. Robertson—about the same year (1777) as that in which the present castle was built. The trees are numerous and flourishing in spite of proximity to the sea. North of the castle, a thickly-wooded bank extends right down to the sandy sea-shore, the trees extending nearly to high-water mark. Throughout the policies there was a fine show of flourish on different species of trees.

After visiting the beautiful flower garden and the castle terrace, which commands a noble sea prospect, a descent was made to the shore at the base of the cliff on which the castle stands. Some time was spent here, and the well-known "Coves of Culzean," which are old sea caves, were visited. Some of the party proceeded along the rough shore, but the majority preferred to return to the grounds and woodlands. The picturesque pond, with its water-fowl, was also visited. Shrubs and flowering plants are being planted in considerable numbers on its banks at present. Either to assist in this work, or for some other object, the water had been partially drawn off, and the pond did not appear at its best. A short visit was paid to the gardens; and the Rhododendron, said to be the largest in the country, and the great Fig tree were seen. Leaving the policies at Sunnyside, the bulk of the party proceeded to Crossraguel Abbey, but time only allowed a brief stay to be made here. The abbey is one of the most complete of the ruined ecclesiastical buildings of Scotland, and seems to be carefully preserved. Maybole was reached again about 5 o'clock, and a welcome "high tea" partaken of at the Commercial Hotel.

The following specific observations were made:—

Mammalia.—A herd of Fallow Deer (*Cervus dama*, L.) used to be kept in a park, but they now run wild in the Culzean woods and do so much damage to the trees that the deer are being shot down. There are also a considerable number of Roe Deer (*Capreolus caprea*, Gray) known to be in the policies.

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Aves.—Chiffchaffs (*Phylloscopus rufus*, Bechs.) brought themselves to notice at Culzean by calling frequently in the tree-tops. They were heard in some ten different places. The Wood Wren (*P. sibilatrix*, Bechs.) was also heard several times. Crossraguel Abbey and the adjacent Baltersan Castle are great haunts of the Swift (*Cypselus apus*, L.), many dozens of which were flying around. Mr. John Paterson called on the head gamekeeper, and saw in his collection stuffed locally-taken examples of the Rough-legged Buzzard (*Archibuteo lagopus*, Gmel.), a species not otherwise recorded for Ayrshire so far as is known; also a Hen Harrier (*Circus cyaneus*, L.) and Peregrine Falcon (*Falco peregrinus*, Tunst.) This is how our grander birds of prey are accounted for!

Insecta.—Mr. A. Ross collected the following *Tipulidæ*, but reports that "daddies" were scarce, probably because no "wild" ground was gone over:—

1. *Limnobia nebeculosa*, Mg.
2. *Dicranomyia chorea*, Mg.
3. *Rhipidia maculata*, Mg.
4. *Empeda nubila*, Schum.
5. *Molophilus appendiculatus*, Staeg.
6. *Rhypholophus nodulosus*, *Mcq.*
7. *Amalopis immaculata*, Mg.
8. *T. vittata*, Mg.
9. *Tipula oleracea*, L.

Some other *Diptera* were also collected which have not yet been identified.

Phaenogamia et Filices.—Mr. J. R. Lee reports the following as the most noteworthy plants:—

Cheiranthus Cheiri, L.	On shore at Culzean; also at Crossraguel.
Chelidonium majus, L.	At Crossraguel Abbey.
Ligusticum scoticum, L.	On shore at Culzean.
Smyrnium olusatrum, L.	Do.
Asperula odorata, L.	In Culzean Castle Grounds.
Orchis mascula, L.	Do.
Neottia Nidus-avis, Rich.	Do.

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* *Ornithogalum umbellatum*, L.	In Culzean Castle Grounds.
Scilla verna, Huds.	On shore at Culzean.
Asplenium Adiantum-nigrum, L.	Do.
A. marinum, L.	Do.
Scolopendrium vulgare, Sm.	Do.

Fungus.—The curious fungus *Hirneola auricula-Judae*, Berk., the Jew's Ear, was gathered by Mr. John Paterson, on an old Elder tree.

AIKENHEAD, CATHCART, 30th May, 1901.—Five members of the Society, with Mr. J. J. Robertson as conductor, joined this evening excursion, and were met at the gate of the policies by Mr. Boucher, the gardener, who led the party over the grounds. The Chestnut trees in front of the house were particularly admired, the new rockery was inspected, and the garden and greenhouses were visited. In some of the latter, the British Maidenhair Fern (*Adiantum capillus veneris*, L.) was growing very luxuriantly, and propagating itself in every nook and crevice.

GARSCUBE, 13th June, 1901.—Only three members of the Society made up the excursion party on this evening. The wide extent of the estate, with its beautiful situation and exquisite views of the Kelvin, was much admired. There was an extraordinary wealth and variety of Rhododendrons, which specially attracted attention.

COREHOUSE, LANARK, 15th June, 1901.—A party of about twenty visited Corehouse Estate and Corra Linn, on the Clyde, in pleasant weather. Interest was particularly taken in the introduced shrubs and trees. It was observed that, while in the various estates of the West of Scotland it is quite usual to come across individual examples of the Common Maple, Norway Maple, and Turkey Oak, at Corehouse the introduced species were not in solitary isolation amongst native trees, but occurred in such abundance and rich profusion as to give quite a characteristic appearance to the various avenues and shrubberies.

* Evidently an introduction, but apparently now naturalised.

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CREAG-NA-CAILLICH, KILLIN, 22nd June, 1901.—A joint excursion of the Natural History and Geological Societies of Glasgow was made to this locality under the leadership of Mr. Peter Macnair. The mountain is situated at the western end of Loch Tay, and rises to an elevation of 2,990 feet above sea level, immediately to the north of the village of Killin. It has long been famous in the annals of Scottish botany, being often mentioned in Lightfoot's *Flora Scotica* as most probably the locality where Stuart, the minister of Killin, first gathered the Alpine plants of Scotland. Geologically, it has also been known for a considerable period, a short account of its mineral wealth having been published in 1814 in the *Transactions of the Geological Society of London* by that pioneer in Scottish geology, Macculloch. In this paper he refers to the occurrence of that comparatively rare British mineral—rutile—among the schists capping the summit of this mountain, and from that period we always find it given in English text-books.

On the party arriving at Loch Tay pier, the conductor first explained the geological structure seen at the base of the mountain. Fine sections were seen of the Loch Tay limestone and its accompanying altered basic rocks. The party also examined the old yew trees at Finlarig, whilst a number of interesting plants were noted amongst the thick undergrowth which covers this part of the Loch side. Ascending from the loch to the Kenmore Road, a number of interesting sections in the limestone at Drum-na-Larig were noted. Mr. Macnair pointed out that at this point the limestones had been extremely folded, the axes of the folds hading towards the N.W., and the overfolding being consequently towards the S.E. The under limbs of the folds are distinctly thinned, and the whole evidence goes to show that the thrust has been from the N.W.

After a slight refreshment, the actual ascent of the mountain began, the route being by the stream which enters the Lochay near the inn. At first the track leads across the limestones, the mountain stream having at this point cut a deep gorge in these rocks. The botany of this gorge has been well worked out by Mr. D. Haggard. Proceeding up the mountain side, a halt was made to examine some fine sections of the garnetiferous mica schists which overlie the Loch Tay limestone. At certain points the

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garnets can be gathered in handfuls, weathered out of the schists, but still retaining their crystalline form. Further up the ridge, a series of banded hornblende schists were seen. These, the conductor explained, had at one time been injected into the clastic schists as sills of basic igneous material, and had subsequently undergone the same deforming operations as had affected the clastic rocks.

On reaching the 2,000 feet contour line, an altogether different group of schists was seen to take the place of the garnetiferous schists observed in the lower ground. This apparently overlying group of schists is of the nature of a true phyllite, being finely foliated, and the foliation planes themselves being often folded and crossed by later divisional planes. It is upon these schists that the Alpine plants have established themselves, and they are found growing luxuriantly all along the outcrop of the phyllites from Creag-na-Caillich eastwards towards Ben Lawers. [Regarding the probable influence that these rocks have had in the distribution of this Alpine flora of Scotland, see a paper by Mr Macnair published in the *Transactions of the Perthshire Society of Natural Science.*] The return journey was made by Meal Dhuin Croisg, where a somewhat extensive landslip has recently taken place. The cup-and-ring markings in Glen Lochay were also examined. During the day, a number of the well-known Alpine plants were gathered on the summit of Creag-na-Caillich.

CATHCART NURSERIES, 5th July 1901.—The Society this evening visited the Nurseries of Messrs. Austin & M'Aslan, at Cathcart. The large collection of young coniferous trees attracted attention, many species and varieties of *Abies, Pinus, Cupressus, Retinospora,* &c., being cultivated. Not many shrubs were in bloom, but *Hedysarum multijugum,* Maxim, with its deep violet red flowers, as well as several varieties of *Weigelia* and *Spiræa* attracted notice. At this time of the year, many thousands of Roses were being "budded," and the operation was performed and explained by one of the foremen. The fruit trees and glass-houses were thereafter inspected. The conductor was Mr. John Cairns, Jun.

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Proceedings of the Society.

SESSION 1900-1901.

24TH SEPTEMBER, 1900.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

Mr. D. R. Somerville read a report of the Society's excursion to Camis Eskan (see page 251).

Mr. Wm. Stewart reported on an excursion to Douglas Support, and recorded having found twelve species of fungi (see page 253).

Mr. Thos. Beath Henderson, M.D., 55 Bath Street, was elected an Ordinary Member.

Mr. John Cairns, Jun., exhibited a fertile cone of *Araucaria imbricata*, Pav., from Buchanan Castle, Drymen.

On behalf of Mr. R. D. O'Brien, Limerick, the President exhibited fresh specimens of *Scirpus triqueter*, L., a rare bulrush, new to the Irish flora, which Mr. O'Brien, in company with Mr. R. Lloyd Praeger, M.R.I.A., had discovered last month on the muddy banks of the Shannon, near Limerick. The peculiarities of the plant were referred to, and comparisons instituted between the lake and the sea *Scirpus* dried specimens of which were also shown.

Mr. Johnstone Shearer exhibited a large and interesting collection of plants from Tor Bay, Devonshire.

Mr. Wm. Stewart reported on the Conference at Boat of Garten, from the 17th to the 21st September, of the British Mycological and the Scottish Cryptogamic Societies. He recorded the discovery of *Gyrodon sistotrema*, Fr., a species new to the British flora. He remarked that the special feature of the Rothiemurchus locality was the abundance and variety of the genera *Hydnum* and *Cortinarius*. Of the former, eleven species were found—four being rare, viz., *H. imbricatum*, L., *H. fragile*, Fr., *H. compactum*, Pers., and *H. zonatum*, Batsch. Of the latter, 25 species were identified, many of them unrecorded for the Clyde area, and several of them uncommon in the Rothiemurchus district, such as *C. cyanopus*, Fr., *C. multiformis*, Fr., *C. varius*,

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Fr., and *C. argentatus*, Fr. Of the *Polypori*, 9 species were found, 2 being rare—*P. schweinizii*, Fr., and *P. vaillantii*, Fr., and 2 uncommon—*P. fragilis*, Fr., and *P. amorphus*, Fr. A rare *Frametes*—*F. pini*, Fr., was found on the same trees from which specimens were taken when the Cryptogamic Society visited the woods in 1890. *Boletus* furnished 14 species, *Hygrophorus*, 13; *Russula*, 9; *Lactarius*, 11; among them *L. scrobiculatus*, Fr., a very rare yellow species, with abundant white milk, soon turning sulphur yellow when exposed to the air. Of the Agarics, *Tricholoma* supplied 20 species, including *T. equestris*, L.; *T. portentosus*, Fr.; *T. pessundatus*, Fr.; *T. acerbus*, Bull.; *T. imbricatus*, Fr.; *T. sulphureus*, Bull.; *T. vaccinus*, Pers., and *T. melalencus*, Pers., uncommon here. Amongst the other rare fungi gathered were *Strobilomyces strobilaceus*, Berk., *Sistotrema confluens*, Pers., *Nœmatelia encephala*, Fr., *Meruliu pallens*, Berk., and *Leotia circinans*, Pers. On the way home by the Caledonian Canal, a large and fine specimen of *Sparassis crispa*, Fr., was gathered in a pine wood in Glen Urquhart.

Mr. Stewart exhibited a large number of the fungi thus obtained.

30TH OCTOBER, 1900.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

This being the 49th Annual General Meeting of the Society, the Hon. Secretary read the

REPORT OF THE COUNCIL (1899-1900).

Meetings.—Eleven were held, at all of which business was transacted. The attendance was satisfactory, the large hall having on two occasions to be requisitioned.

Excursions.—A programme of excursions was drawn up for four whole day, eight afternoon, and three evening excursions, but some of the latter had to be abandoned owing to the inclemency of the weather. Three of the excursions were held jointly with the Geological Society, two with the Andersonian Naturalists' Society, two with the Edinburgh Field Naturalists' and Microscopical Society, and one with the Airdrie Natural History Society. In no case, however, was there a large attendance.

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Obituary.—During the Session, the deaths of five members were brought under the notice of the Society.

British Association.—Mr. James F. Gemmill, M.A., M.D., represented the Society as its delegate at the meeting held at Bradford.

Membership. — During the session twenty new Ordinary Members (one of whom was a Life Member) were added to the roll, and also five Corresponding Members. The number on the register is as follows :—

Honorary Members, - - - - -		12
Corresponding Members, - - - -		41
Ordinary Members (Life), - - -	28	
(Annual Subscriptions), - -	273	
		301
Total, - - - -		354

Associates.—The number on the roll stands at eighteen.

Finance.—The Hon. Treasurer (Mr. John Renwick) submitted his Annual Statement of Accounts, duly audited. This was found to show a balance at the credit of the Ordinary Fund of £121 10s. 4½d., and of the Life Members' Fund of £147. It was pointed out that from the Ordinary Fund there should have been deducted the cost of *Transactions* for 1898-99 and 1899-1900, but this could not be done, as the printer's account for the same had not been rendered when the books were audited.

Library.—Mr. Mitchell, the Hon. Librarian, reported as follows:—"The interest of the members in the Library of the Society is being maintained. In addition to the large number of works consulted in the rooms, 300 volumes and journals have been issued to the members during the session, a number that is about equal to last year, which was the largest on record since the Library was formed.

"During the month of March last Part III. of Vol. V. of the Society's *Transactions* was issued to the members. This Part has also been sent to the various British Societies and Institutions with which we exchange publications. The usual number of exchanges have been received during the year. These now

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include nearly all the Scottish Societies of importance which issue *Transactions*. Several volumes have been gifted to the Library from various members and friends, and to these we owe our thanks.

"The usual number of additions, by purchase, have been made during the session.

"During the summer months one of our Life Members presented to the Library sufficient funds to procure the reproduction of a book-plate for our books. The original of this was artistically drawn by one of our members, Mr. John Fleming. This has now been placed in most of our volumes. We owe our grateful thanks to both of these gentlemen for their kindness in so benefiting the Library.

"The attention of members is again called to the stock of Foreign and Colonial *Transactions* housed in the Mitchell Library, which may be consulted or borrowed at any time during the open hours of the Library. Members are also reminded that books may be consulted or borrowed from our own Library, at any time during the day, on application to Mr. Martin, the Curator. The books in the Library are all in good condition. The *Transactions* and Magazines are all bound up to date."

Transactions.—The Hon. Editor (Rev. G. A. Frank Knight, M.A.) reported that Part III. of Vol. V. (N.S.) of the *Transactions*, covering Session 1898-99, was issued to members in March. He also intimated that the Part dealing with Session 1899-1900 was now being dealt with.

The Reports were all unanimously approved of and adopted.

The following Office-Bearers were appointed to fill vacancies in the Council:—Mr. James F. Gemmill, M.A., M.D., as Vice-President; Mr. Andrew A. Dalglish, F.E.S., Mr. John Fleming, Mr. John Paterson, and Mr. Robert Henderson, as Members of Council. Mr. William Leighton and Mr. James Jack were reappointed Auditors.

The following were elected Ordinary Members of the Society:—Rev. William Trotter, M.A., Free Church Manse, Bannockburn; Mr. W. J. Gibson, M.A., Nicolson Schoolhouse, Stornoway; Mr. William W. Fullarton, M.D., Ballantrae; Mr. David Nimmo, Jun., 17 Duke Street, Hamilton; Mr. James Short, M.A., 40 Blantyre Street.

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Dr. J. F. Gemmill drew the attention of the meeting to the fact that their President had been unanimously appointed President of the Conchological Society of Great Britain and Ireland for the meeting to be held in Glasgow in 1901, and suggested that the Society should convey to him their congratulations. This was heartily agreed to. Dr. Gemmill then read his report as the Society's delegate to the British Association Meeting in Bradford. The following work was recommended to be undertaken by local societies. Section C (Geology)—Photographs of erratic blocks and boulders; Section D (Zoology) —(*a*) Migration of birds, (*b*) Number of days in which birds hatch out, (*c*) Records of the captures of injured specimens of insects, chiefly Lepidoptera, showing attacks by birds or lizards; Section H (Anthropology)—Photographs of prehistoric monuments, weapons, pottery, &c.

Mr. James Whitton read a report of an excursion to Tollcross Park (referred to in Part II., page 163). A very interesting collection of trees and shrubs is there being accumulated for experimental purposes. Much satisfaction was expressed that a property so naturally interesting had fallen into the hands of the Corporation, and the hope will be echoed that the natural features will be retained and extended.

Mr. Thos. Wilson, Ayr, exhibited the Larva and Pupa of *Acherontia atropos*, L., the Death's Head Moth, from Lendalfoot, Ayrshire, which are seldom met with. Mr. Wilson showed also the Imago of *Sphinx convolvuli*, L., the Convolvulus Hawk-moth, from Ayr, and in addition, a very fine specimen of Pectolite from Lendalfoot.

Dr. Jas. F. Gemmill showed a set of lantern slides from photographs and micro-photographs, illustrating the anatomy and external appearances of some young one-eyed trout, in which the very rare and interesting phenomenon known as Cyclopia was present.

27TH NOVEMBER, 1900.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

Mr. John Renwick reported on the Society's excursion to Buchanan Castle, on 24th September (see page 254).

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Mr. David Bruce exhibited a stuffed specimen of an Albino Common Cormorant, *Phalacrocorax carbo*, L., shot on Loch Roag. He detailed a former hunt he had had for a specimen of this bird, in the course of which he observed that the wings were not used for propulsion when swimming, and when expanded serve only for purposes of balance.

Mr. John Lindsay, M.A., M.B., C.M., showed specimens of Supernumerary Digits, to illustrate the 12th chapter of Darwin's "Variation of Animals and Plants under Domestication." Of special interest was the foot of a Horse, which, by the presence of an extra toe, revealed reversion to the type of Hipparion, a long extinct ancestor of the Horse. With regard to the explanation generally of extra fingers and toes, Dr. Lindsay demurred to Darwin's suggestion that these were due to reversion to a lower type.

On behalf of Mr. M'Culloch, taxidermist, there was exhibited a Grey-hen from Islay, assuming the plumage of the Blackcock. The neck and shoulders of the bird were blue; the back several shades darker than is usual in the Grey-hen; the tail almost black; under tail coverts white; and it had also white shoulder spots. Such birds are generally known to be barren, but the owner of this specimen believed it to be the same as one frequently observed at the same place with a young brood.

Mr. Alex. Patience exhibited about twenty-four specimens of the Higher Crustacea from the Firth of Clyde, and a few other marine forms. In his remarks he dealt with the phenomenon known as commensalism, illustrated by the dwelling together of the Hermit-crab, *Eupagurus prideauxi* (Leach), with the Sea anemone, *Adamsia palliata* (Bohad.); and of the Hermit-crab, *Eupagurus pubescens* (Kr.), with the Sponge (*Suberites suberea*, Gray), and which receives as a boarder a small segmented worm, which acts the part of a scavenger. Mr. Patience also gave some notable instances of Parasitism, *e.g.*, *Sacculina carcini* (Thomp.), on the abdomen of the Shore-Crab, *Carcinus mænas* (Penn.); *Chondracanthus lophii*, Johnst., from the gill-pouches of the Angler-fish (*Lophius piscatorius*, L.); *Lernœa branchialis*, L., from the gills of whiting; and the Isopods, *Pseudione affinis*, G. O. Sars, and *Phryxus abdominalis* (Kr.), the former from the gill chambers, and the latter from the abdominal cavity of the shrimp, *Pandalus montagui*, Leach. The phenomenon of "masking"

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was illustrated by specimens of *Inachus dorsettensis* (Penn.), and *Hyas coarctatus*, Leach, completely covered with algae. Other organisms exhibited were *Stenorhynchus tenuirostris* (Fabr.); *S. rostratus*, L.; *Munida rugosa* (Fabr.); *Galathea squamifera*, Leach; *Porcellana platycheles* (Penn.); *Leander squilla*, L.; *Crangon vulgaris* (L.); *Hippolyte pandaliformis*, *Portunus puber*, L.; *Ebalia cranchii*, Leach; *E. tuberosa*, Penn.; *E. tumifacta* (Mont.); *Pinnotheres pisum* (L.); *Eurynome aspera*, Penn.

Dr. Robert Brown read a paper entitled "The Upper Engadine: Botanical Work amongst its Higher Peaks," and exhibited many of the specimens he had collected there. He described the formation of the Engadine Valley, with its upper portion so greatly frequented by British tourists. The various peaks, the glaciers, the deep valleys, and the wonderful rock and cliff scenery were passed in review, with a brief account of those mountains whose summits he had reached. Near the top of Pizot, 10,660 feet, many examples of *Eutrichium terglonense*, Kern., were growing, a beautiful plant of the family Boraginaceae, which seems really a *Myosotis*. It is very woolly, the hairs having a silky appearance, and, seen growing in large broad cushions, with its intensely blue flowers open to the sun, it is indeed a fair spectacle. Here also were found *Gnaphalium supinum*, L., and *Phyteuma pauciflorum*, L. Near the base were many plants of *Senecio nicanus*, var. *carexolicus* Willd., rather a rare species, and purely alpine. Besides the common *Gentiana bavarica*, L., with its var. *imbricata*, Schleich, and *Juncus jaeginus*, L., with its bright crimson stamens projecting above its blackish head, was *Arenaria biflora*, L., a rather rare, and certainly very local high alpine species. Another mountain, Piz Padella, 9,460 feet, is noted for its varied flora. Here were found *Lychnis flos jovis*, L., *Senecio abrotanifolius*, L., with orange flowers and leaves of narrow linear segments; *Ranunculus parnassifolius*, L., a very rare and local plant; *Gentiana acaulis*, L., and *Anemone alpina*, L., in great abundance, and the striking flowers of *Arnica montana*, L. At the base of the overhanging cliffs forming the summit were great colonies of *Carex nigra*, All., and *C. atrata*, L., intermixed with large flowering masses of *Hedysarum obscurum*, L., and *Oxytropis montana*, Dec., both very beautiful members of the Leguminosæ. There were

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many species of Saxifrage, but the most striking was *S. cæsia*, L., its blue-grey leaves beautifully recurved, firmly massed together, and practically covered with white and yellowish flowers. On descending to the green slopes, *Dianthus superbus*, var. *grandiflorus*, L., was seen in great profusion, from one to two feet in height, the large fringed flowers having almost a dazzling appearance in the sunshine. *Botrychium lunaria*, Sw., was observed remarkably fine, and *Serratula rhapontica*, Dec., was very striking in its aspect. The latter, a rare plant, grows about 2 feet high, and the long flower stem is leafless for about a foot at the top. The flower is light purple. On the slope of a mountain near Pontresina, there were large plants of *Sempervivum tectorum*, L., with light red, and *S. vulfeni*, Hoppe, with greenish-yellow flowers, and as the colours were in profusion and well mixed, the effect on the hillside was remarkable.

21st December, 1900.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

It was intimated that Dr. Robert Brown, Vice-President, had accepted the office of Senior Honorary Joint-Secretary, and that Mr. H. B. Watt had agreed to act as the Society's representative on the Committee of Management of the Millport Marine Biological Station.

The donors of further contributions to the fund for the purchase of a lime-light lantern were thanked, and it was intimated that the fund had reached £22.

Mr. Anderson Fergusson exhibited two species of Coleoptera, collected many years ago by Rev. J. E. Somerville, B.D., F.S.A.Scot., viz., *Pterostichus lepidus*, F., found at Tollcross, Lanarkshire (where Mr. Thos. G. Bishop also met with it 30 years ago), and *Dytiscus lapponicus*, Gyll., a large water beetle, taken in hill tarns in the Island of Mull, and in County Donegal. The former is a local species, distributed over the British Isles. *D. lapponicus* was discovered in Scotland in 1854 by Rev. H. Clark, who obtained specimens in Mull, where Mr. Somerville met with it between Loch Spelve and Loch Buy. It is a truly hyperborean species, and occurs in lakes in Norway and Sweden, and also in Northern Germany.

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The President exhibited dried specimens of *Glaucium flavum*, Crantz. (*G. luteum*, Scop.), the Horned Poppy, from English, Irish, and Scottish coast localities, the Irish specimen having been lent for the occasion by Mr. Nathaniel Colgan, M.R.I.A., joint-editor with Dr. R. W. Scully, F.L.S., of the "Cybele Hibernica." This large and handsome yellow poppy was referred to as "a vanishing quantity" in Scotland, partly owing to the action of the thoughtless in rooting it up. When Hewett C. Watson issued the "New Botanist's Guide," in 1837, the plant was still "plentiful on the shore at Helensburgh," and "abundant in Arran." From both of these quarters it has long since disappeared, and now only occurs, very sparingly, at two spots on islands in our estuary. The six species of *Glaucium* known to science, including the British one, belong to the Mediterranean region. All occur in Syria and Palestine—one (*G. aleppicum*, Boiss.) being of a rich crimson, and all, excepting *G. flavum*, being inland plants.

On behalf of Mr. Thos. G. Bishop and of Mr. John Henderson there were shown a number of specimens of the fruit of the Almond Tree (*Amygdalus communis*, L.) grown in the open air at Helensburgh. Mr. Bishop's trees, at Dalmore, 25 feet above the sea-level, have fruited for the first time this year. Mr. Henderson's trees, at Towerville, about 75 feet above the sea, are older, and have fruited several times previously.

On behalf of Dr. T. F. Gilmour there were exhibited fresh specimens of *Potentilla fragariastrum*, Ehrh., the Barren Strawberry, found blossoming in abundance at Ardbeg, Islay, on 10th instant, quite two months before the usual time of flowering, and indicating the mildness of the season.

The President made a statement with regard to the three prospective European Expeditions to the Antarctic Regions—viz., the British, German, and Scottish—and referred specially to the last named, which is to be under the leadership of Mr. William S. Bruce, F.R.S.G.S. The results of the intended Scottish Expedition are likely to be of special interest to biologists, as deep-sea work, dredging at great depths, and tow netting are to be extensively engaged in. The meeting adopted a motion of sympathy with Mr. Bruce in his arduous work of obtaining the £35,000 required for a three years' absence, and of which about £11,000 have now been subscribed.

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29TH JANUARY, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

The President referred to the great loss sustained by the British Empire, and by the world, through the lamented death of our revered Sovereign, Queen Victoria. In fitting terms, he passed a eulogy on the late Queen's deep interest in everything calculated to promote her people's welfare, on her marvellous attention to the exacting duties of her exalted station, on the largeness of her heart for the distressed and the suffering, on the pathetic manner in which she bore her own great sorrows, and on her obedience to the dictates of highest Christian principle. He pointed out, as a reminder of the great length of Her late Majesty's reign, that although the Society this year attained its Jubilee, Queen Victoria had already been fourteen years on the throne before the Society was instituted. He concluded by the expression of the hope that her son, King Edward, would have a reign equally glorious in every respect.

Mr. J. R. Thomson, 6 Vinicombe Street, Hillhead, was elected an Ordinary Member.

A mounted specimen of the Slavonian Grebe, *Podicipes auritus*, L., shot on Black Loch, Slamannan, was exhibited by Mr. James Jack, by favour of Mr. Reston.

Mr. John Smith, Monkredding, Kilwinning, exhibited a specimen of a minute, white, worm-like animal, supposed by Mr. Thos. Scott, F.L.S., to be *Mermis albicans*. Mr. Smith procured it in the earth about 600 feet above sea-level. When taken out of the earth, it was pure white. Mr. Smith also showed some eggs of the Earth-worm.

Mr. Smith made the following correction on a paper he had contributed to the *Transactions*, on the "Conodonts from the Carboniferous Limestone of the West of Scotland." He had therein stated that the dental apparatus of existing mollusca are silicious. This he believed to be the common opinion of

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naturalists, founded on the fact that the radula of recent gastropods is not affected by acid, but Dr. G. J. Hinde (who described the specimens) had since informed him that it consists almost entirely of chitinous material, as ascertained by chemical investigation.

On behalf of Mr. James Groves, F.L.S., Corresponding Member, the President exhibited *Statice lychnidifolia*, de Girard, a Sea Lavender, new to the Channel Islands, and not previously recorded from within the limits of the British flora. It was discovered in Alderney, in August last, by Mr. Cecil R. P. Andrew, M.A., First Principal of the new Government Training College, Perth, Western Australia. Mr. Somerville also exhibited examples of the four already known British species of the genus *Statice*, viz., *S. limonium*, L., and its var. *pyramidalis*, Syme; *S. rariflora*, Drejer; *S. auriculaefolia*, Vahl., and its three subspecies (*a*) *occidentalis* (Lloyd); (*b*) *intermedia*, Syme; and (*c*) *dodartii* (de Girard); and *S. reticulata*, L. (= *S. bellidifolia*, Gonan).

Mr. James C. Christie read a paper on "Bird Life in Northern Norway." It was illustrated with lantern views from specimens and from drawings by Thorolf Holmboe, artist-naturalist.

26TH FEBRUARY, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

Mr. John George Wight, British Linen Company's Bank, 110 Queen Street, was elected an Ordinary Member, and Miss M. M. Buchanan, 63 West Cumberland Street, was admitted as an Associate.

Mr. R. S. Wishart, M.A., exhibited the following specimens—*Linaria minor*, Desf., from Stepps; *Leontodon autumnalis*, L., var. *pratensis*, Koch., from Robroyston; *Bupleurum rotundifolium*, L., a casual, from Chryston.

On behalf of Mr. D. Dewar, Mr. Christopher Sherry exhibited and read short notes descriptive of—

(1) *Asplenium ceterach*, L., var. *aureum*, Link., a plant found plentifully on the moist rocks of the lower regions of the islands of Teneriffe.

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(2) *Asplenium obtusatum*, Forst., var. *difforme*, a fern resembling the *A. marinum* of Britain, and found on the rocks of the south coast of Norfolk Island.

(3) *Aspidium (Polystichum) triangulum*, Swartz, var. *ilicifolium*, a form with elongated fronds rooting at the points.

(4) The fruit and leaves of the Shaddock, *Citrus decumana*, L.

Mr. Wm. Stewart read a part of a paper entitled "Some Notes on the Ferns and Macrofungi of the Clyde Area," in which he described the methods adopted in defining certain districts of the Clyde Area, with their distinctive species and varieties. He showed also a map in which the districts were defined by boundary lines.

The President laid on the table a copy of the Revised List of the British Marine Mollusca and Brachiopoda, and read a paper prepared by Rev. G. A. Frank Knight, M.A., one of the Vice-Presidents of the Society. Mr. Knight explained how this new list came to be published. Fifteen years ago, there had been issued by Mr. Somerville, the President, a Handlist of the British Marine Mollusca and Brachiopoda, which embraced all the species and varieties mentioned in Jeffrey's "British Conchology," as well as all others up to the date of publication (1886). But in the interval much more had been learned. To Mr. Knight had been entrusted the task of drawing up the list of the Marine Mollusca of the Clyde for the Handbook of the Fauna and Flora of Clydeside, in view of the coming of the British Association to Glasgow in 1901, and he naturally desired to use the best classification and nomenclature. After considerable negotiation, a Committee of the Conchological Society of Great Britain was appointed to draw up a new list. The committee consisted of Dr. George W. Chaster, M.R.C.S., Southport; Mr. James Cosmo Melvill, M.A., F.L.S., Manchester; Mr. W. E. Hoyle, M.A., M.Sc., M.R.C.S., F.R.S.E., Director of the Manchester Museum, Owens' College; and Mr. Knight. They were assisted in their deliberations by suggestions from the following:—Mr. W. H. Dall, Smithsonian Institution, Washington; Mr. J. T. Marshall, Torquay; Mr. Richard B. Newton, F.G.S., London; Mr. Edgar A. Smith, F.Z.S., Keeper of the Conchological Department, Natural History Museum, South Kensington; Mr. Robert

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Standen, Manchester; Mr. Ernest R. Sykes, B.A., Gray's Inn, London; Mr. Bernard B. Woodward, F.G.S., F.R.M.S., British Museum, London; and the Rev. Canon A. M. Norman, D.C.L., F.R.S., F.L.S.

Many knotty problems presented themselves for solution.

I. *Area.*—This question was thoroughly discussed, and the final decision was to accept Canon Norman's definition of the British Area, as laid down in his paper in the *Annals and Magazine of Natural History* (6), Vol. V., pp. 345, 454, (1890), but with the addition of the Channel Isles. The area embraces the Dogger Bank, but excludes the "Cold Area" between the Shetlands and the Faroes. The area being defined, the committee were at liberty to include in their list all the mollusca obtained by different expeditions within the British limit, and of these the following are the more important:—

(1) The "Lightning," in 1868, under Drs. Carpenter and Wyville Thomson;

(2) The "Porcupine," in 1869, under the same scientists, with the addition of Dr. Gwyn Jeffreys. Only the mollusca obtained by these expeditions within the defined British area could be used in the compilation of the list (*Proc. Zool. Soc.*, 1878-85);

(3) The "Knight-Errant," in 1880, under Sir John Murray (*Proc. Royal Soc. Edin.*, Vol. xi.);

(4) The "Triton," in 1882, under Sir John Murray (*Proc. Zool. Soc.*, 1883);

(5) The Royal Irish Academy's Expedition in the "Lord Bandon," in 1885-86; and in

(6) The "Flying Falcon," in 1888 (*Proc. R.I.A.*, 1886, 1898),

(7) The "Flying Fox," in 1889, under the Rev. W. Spotswood Green (*Ann. and Mag. Nat. Hist.*, Ser. 6, Vol. IV., 1889, p. 409).

(8) H.M.S. "Research," in 1889, by Mr. G. C. Bourne (*Journal of the Marine Biological Assoc. of the United Kingdom*, N.S., Vol. I., 1889-90, p. 306).

II. *Classification.*—The Committee found that while Jeffreys' classification was admittedly very defective, there was no other scheme in the field at present which it would be advisable to

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adopt *in toto.* They resolved, therefore, to make the anatomical system of Pelseneer their general basis, but in all groups to adopt the classification of individual workers who had specialized in their particular departments. The new classification thus established led to many transpositions of genera and species from the old standard of Jeffreys.

III. *Nomenclature.*—All previous workers in the compilation of lists, and all writers on the Mollusca of Britain, had taken the *12th* Edition of the *Systema Naturæ* of Linné (issued in 1767) as the *terminus a quo* of the binomial nomenclature. The Committee felt bound to follow the recent trend of science, and to go back to the *10th* Edition, which was published in 1758. Following the law of priority of nomenclature, they had to relinquish many time-honoured names, and to substitute titles which had claims to precedence. But wherever a change of this sort was necessary, the former familiar name had been enclosed within square brackets.

IV. *Insufficiently attested species.*—The Committee felt bound to be somewhat severe towards many doubtful claimants for recognition, and in many cases a number of varietal names, apparently based on monstrous, stunted, aborted, or young specimens, had been omitted. Exotic migrants, and recent-looking post-tertiary shells had also to be carefully distinguished from the legitimate ones.

The following is a comparison between Mr. Somerville's List of 1886 and the new Revised List of the Conchological Society in 1901, showing the progress made during the intervening years :—

The total number of *species* of mollusca in 1886 was 551, ...	Increase, 169.
The total number of *species* of mollusca in 1901 is 720, ...	
The total number of *species* and *varieties* in 1886 was 957, ...	Increase, 201.
The total number of *species* and *varieties* in 1901 is 1,158, ...	
The total number of *species* of *Brachiopoda* in 1886 was 7, ...	Increase, 2.
The total number of *species* of *Brachiopoda* in 1901 is 9, ...	

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The total number of *species* and *varieties* of *Brachiopoda* in 1886 was 9, ...	Increase, 3.
The total number of *species* and *varieties* of *Brachiopoda* in 1901 was 12, ...	
Grand total of Mollusca and Brachiopoda (spec. and var.) in 1886, ...	966
Grand total of Mollusca and Brachiopoda (spec. and var.) in 1901, ...	1,170

An increase of 210 over all.

26TH MARCH, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

The Secretary reported that the President had been appointed to represent the Society at the Ninth Jubilee Celebrations of the University of Glasgow, to be held in June of the present year.

Mr. Thos. Beath Henderson, M.D., exhibited a fresh specimen of *Ophisaurus apus* (Boul.), the Glass Snake, so called, but which is in reality a lizard closely resembling a snake, the fore limbs being entirely absent, while the hind limbs are extremely rudimentary. He also showed the head and rattle of *Crotalus terrificus* (Cope), the Rattlesnake, from Brazil, and vividly described the structure of the poison glands and fangs.

Mr. Frank M'Culloch brought forward for exhibition the following specimens:—

(1) *Acanthis linaria* (L.), the Mealy Redpoll, from Barra.

(2) *Sylvia nisoria* (Bech.), the Barred Warbler, from Barra.

(3) *Spatula clypeata* (L.), the Shoveler, from Loch Lomond.

(4) *Laurus glaucus*, O. Fabr., the Glaucous Gull, from Barra.

Mr. John Paterson gave a careful description of these birds, with information on their habitats, and their frequency in different districts of this country.

Mr. Paterson also read extracts from a Manuscript, written by the late Dr. John Grieve, dated 1847, and descriptive of the birds seen by him about that period in the North-eastern district of Glasgow. (See page 181.)

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30TH APRIL, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

The meeting was devoted to a lecture on "Ants," given by Mr. J. G. Goodchild, F.G.S., F.Z.S., of H.M. Geological Survey. The lecturer began with a general description of the anatomy of ants, and then in considerable detail gave a series of facts, verified by observation, illustrative of their social life and domestic habits. With the aid of a number of beautiful lantern slides, Mr. Goodchild showed the origin and development of new ant communities under a queen, and described the many ways in which the activities of an ant colony are exercised, the various duties of the males, females, and neutrals or workers being all explained at length. He then touched on the subject of ant parasites and commensals; on the attack made by Aphides on honey-secreting plants; and on how these attacked plants protect themselves against injury. The lecture was highly appreciated by a large audience, and the lecturer awarded a hearty vote of thanks.

28TH MAY, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

Mr. J. J. Robertson reported on the excursion to Cadzow, on 27th April (see page 258), and Mr. Thos. Boyle contributed a similar statement on that to Castlemilk, on 16th May (see page 259).

It was intimated that the Council of the Society had voted a contribution of a guinea towards the maintenance of the Millport Marine Biological Station.

On behalf of Mr. Andrew Gilchrist, there was exhibited a specimen of the alien leguminous plant, *Trigonella fœnum-græcum*, L., the Fenugreek, found growing in 1898, as a casual, at Doonfoot, Ayr, and identified by Mr. S. T. Dunn, B.A., F.L.S., of the Royal Gardens, Kew. The plant is interesting as having been known to, and cultivated by, the ancient Greeks, who grew it for spring forage, and for the properties of its seeds, which, according to Loudon, were "useful

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in fomentations, and in dispersing tumours, &c." It is native in Northern Italy, Persia, and Mesopotamia; doubtfully so further west.

On behalf of Mr. W. J. Gibson, M.A., there was shown, from the neighbourhood of Stornoway, a luxuriant fresh specimen of *Ajuga pyramidalis*, L., the Pyramidal Bugle, a plant of the Labiate order, rare, though native in Britain. It occurs in Westmoreland, and very sparingly northwards through Argyleshire, West Inverness, and the outer Hebrides, to Orkney; also in County Clare and the Arran Isles.

With this plant were shown by the President, for comparison, dried examples of the other two British species of *Ajuga*, viz., *A. chamaepitys*, Schreb., confined to the south coast of England, and *A. reptans*, L., the Bugle, common throughout our islands.

Mr. Hugh Boyd Watt read a paper on "The Seals, Whales, and Dolphins of the Clyde Sea-area." (See page 191.)

Mr. Andrew Gilchrist contributed a paper "Note on the occurrence in Ayrshire of *Trigonella fœnum-græcum*, L."

A paper by Mr. James Whitton, Superintendent of Parks, entitled "Meteorological Notes and Remarks upon the Weather during the year 1900, with its general effects upon Vegetation," was, after remarks from Mr. J. J. Robertson on its leading features, held as read. (See page 198.)

25TH JUNE, 1901.

Mr. Alex. Somerville, B.Sc., F.L.S., President, in the chair.

Mr. H. B. Watt gave in a report of the excursion, on May 23rd, to Culzean Castle. (See page 259.)

Mr. J. J. Robertson reported on the excursion to Aikenhead on May 30th. (See page 262.)

The Society's excursion to Garscube, on June 13th, was commented on (see page 262); and lastly, Mr. John Paterson referred to the excursion, on June 15th, to the Falls of Clyde and Corehouse (see page 262).

Mr. Robert M. Hogg, B.A., Georgefield, Irvine, was elected an Ordinary Member.

On the motion of the President, a vote of thanks was accorded to ex-Lord Provost Sir James Bell, Bart., a Life Member, for a

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donation of £5 received from him to cover the cost of engraving and printing a book-plate for the Society's library which had been designed by Mr. John Fleming.

On behalf of Mr. Andrew Gilchrist, there was exhibited a fresh specimen of the "Coral-root" orchis, *Corallorhiza innata*, R. Br., from the Kilmarnock district, a leafless saprophyte, or feeder on dead organic matter, whose discovery in this locality re-establishes it as an Ayrshire plant, a circumstance which since 1874 had been doubted. The President read letters received from Professor Traill, F.R.S., and from Mr. Arthur Bennett, F.L.S., corresponding members of the Society, expressing much interest in the rediscovery of this plant in the south-west of Scotland.

Mr. Anderson Fergusson read a paper entitled "Additions to the list of Scottish Coleoptera" (see page 214), and exhibited at the same time some beautifully preserved specimens of some of those named, including *Leistus spinibarbis*, F.; *Badister sodalis*, Duft.; *Bembidium affine*, Steph.; *Gyrophæna pulchella*, Heer.; and *Tachyporus formosus*, Matth.

The President referred to his experiences as the representative of the Society at the Ninth Jubilee Celebrations at the University, and spoke in high terms of the completeness of the equipment of the new Botanical Laboratory, which was opened during that time with a striking and memorable oration from the veteran botanist, Sir Joseph Hooker, followed by an address from Lord Lister.

27TH AUGUST, 1901.

Mr. James F. Gemmill, M.A., M.D., Vice-President, in the chair.

Mr. Peter Macnair contributed a report of the Society's excursion to Killin on 22nd June (see page 263), and also exhibited the following Alpine plants, *Salix lanata*, L.; *Phleum alpinum*, L.; *Saxifraga nivalis*, L.; *S. cernua*, L.; *Gentiana nivalis*, L.; *Trientalis europea*, L.; *Saussurea alpina*, D.C., mostly from Ben Lawers.

A report on the excursion to Cathcart Nurseries by Mr. John Cairns was read by Mr. Renwick. (See page 264.)

A specimen of the Long-Eared Bat, *Plecotus auritus* (L.), from Islay, was exhibited on behalf of Dr. T. F. Gilmour, who

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remarked that Mr. Harvie-Brown seems not to have been able to obtain specimens of any bat from that island, though he states that they are "said to occur." Dr. Gilmour had previously recorded the presence both of the Pipistrelle and Long-Eared Bat in the *Annals of Scott. Nat. Hist.*, July, 1897, p. 191. The Pipistrelle is not uncommon in Islay, and has been secured in various parts of the island. The long-eared species is rarer, and Dr. Gilmour had only seen it twice, once in June, 1897, and now on this occasion, when a specimen had been brought to him by the gardener at Kildalton, who remarked that they were to be seen frequently. As the Gaelic names for the two species are not alike, the latter being called by a name signifying "horned," there is in this a proof that both have been known long enough to have acquired distinctive names.

Colonel Harington-Stuart, of Torrance, East Kilbride, exhibited eleven different species of Parasitic Fungi from Natal. Among these were *Aecidium ocimi*, P. Henn.; *A. royenae*, Cke.; *A. ornamentale*, Kalch.; *Puccinia ipomœa*, Cke.; *P. phyllocladia*, Cke., on *Asparagus falcatus*, L.; *Physalospora chienostoma*; *Cephaleuros virescens*, Kunz., on leaves of *Ficus indica*, L.; *Asternia mac-owaniana*, Kalch., on *Celastrus buxifolia*, L.; *Uredo celastrinæ*, Cke., on *Salacia Kraussii*, Harv.

The Colonel also presented to the Society several books, forming part of a series, on "The Plants of South Africa," and received the thanks of the meeting.

A communication was read from the President, Mr. Alex. Somerville, B.Sc., F.L.S., on the cases of poisoning which had recently taken place on the Island of Cumbrae, several lads having received poison from eating the berries of an unknown plant by the wayside. The plant, the President had discovered, was *Oenanthe crocata*, L., the Hemlock Water Dropwort.

The Chairman read extracts from a paper contributed by Mr. F. G. Pearcey, Naturalist on the s.s. "Garland," of the Fishery Board for Scotland, on the "Firth of Forth Deposits." (See page 217.)

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ABSTRACT STATEMENT OF ACCOUNTS—SESSION 1900-1901.

1900.—Sept. 1.						
To Balance—Life Members' Fund, £47 0 0						
Ordinary Fund, on loan, £40 0 0						
Do., in Bank, and in Treasurer's hand,	81 10 4½					
		121 10 4½		£168	10	4½
1901.—Aug. 31.						
To 207 Members' Annual Subscriptions, @ 7s. 6d.,				77	12	6
,, 26 Members' Arrears,				10	2	6
,, 13 Associates' Subscriptions, @ 5s.,				3	5	0
,, 2 ,, Arrears,				0	15	0
,, Interest,				6	18	8
,, *Transactions*, &c., sold,				1	10	7
,, Donations to Library,				7	11	0
,, ,, to Illustration Fund,				2	2	6
,, ,, towards purchase of Lantern,				7	17	0
			£286	5	1½	

From Balance of £103 14s. 1d. fall to be deducted cost of *Transactions* for 1899-1900, and for 1900-1901, and of Lantern.

1901.—Aug. 31.						
By Rent and Attendance,				£9	9	6
,, Postage, Stationery, &c.,				15	18	0
,, Printing Circulars—1899-1900, £6 7s. 6d.; 1900-1901, £12 15s.,				19	2	6
,, Printing *Transactions*, 1898-1899,				68	1	0
,, Carriage on *Transactions*,				1	4	5
,, Lecture and Lantern Expenses,				1	3	0
,, Library—New Books, and Book Plate,	£12 2 6					
Insurance,	0 12 0					
Postage, Stationery, &c.,	1 0 5½					
Binding — 1899-1900, £3 14s. 2d.; 1900-1901, £2 2s. 6d.,	5 16 8					
				19	11	7½
,, Donation to Millport Biological Station,				1	1	0
,, Balance, Life Members' Fund, on loan @ 4%,	*£47 0 0					
,, Balance, Ordinary Fund, on loan @ 4%,	*£40 0 0					
,, Balance, Ordinary Fund, in National Security Savings Bank, and in Treasurer's hand,	63 14 1					
		103 14 1				
				150	14	1
			£286	5	1½	

* On Security of Guaranteed Railway Stock.

Life Members' Fund—			
Invested in 2½ per cent. Debentures of The Modern Permanent Building and Investment Society, Melbourne,	£100	0	0
On loan at 4 per cent.,	47	0	0
	£147	0	0

GLASGOW, 17*th October*, 1901.—We have audited above Accounts, compared same with relative Vouchers and Securities, and find them correct.

(Signed) JAMES JACK, WM. LEIGHTON, } *Auditors.*

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Natural History Society of Glasgow.

SESSION LI.—1901-1902.

OFFICE-BEARERS.

President.

ALEX. SOMERVILLE, B.Sc., F.L.S., 4 Bute Mansions, Hillhead.

Vice-Presidents.

ROBERT BROWN, M.D., 1 Leslie Road, Pollokshields.

JAMES F. GEMMILL, M.A., M.D., 3 Albion Terrace, Hillhead.

JOHN PATERSON, 82 Cumming Drive, Mount Florida.

Hon. Secretaries.

JOHN JAS. ROBERTSON, 9 Queen Mary Avenue.

ROBERT BROWN, M.D., 1 Leslie Road, Pollokshields.

Hon. Treasurer.

JOHN RENWICK, 49 Jamaica Street.

Hon. Librarian.

JAMES MITCHELL, 222 Darnley Street, Pollokshields.

Hon. Editor of Transactions.

Rev. G. A. FRANK KNIGHT, M.A., F.R.S.E., St. Andrew's Manse, Auchterarder.

Members of Council.

JOHN CAIRNS, Jr.
ROBT. KIDSTON, F.R.S.L. & E., F.G.S.
JOHNSTONE MACFIE, M.D.
WILLIAM STEWART.
A. A. DALGLISH, F.E.S.
JOHN FLEMING.
ROBERT HENDERSON.
JOHN R. LEE.
PETER EWING, F.L.S.
WILLIAM LEIGHTON.
JOHN ROBERTSON.
JAMES WHITTON.

Auditors.

JAMES JACK and JOSEPH SOMMERVILLE.

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LIST OF MEMBERS.

HONORARY.

1851. William Ferguson of Kinmundy, LL.D., F.L.S., F.G.S., F.S.A.Scot., Kinmundy, near Mintlaw, Aberdeenshire.

1880. Professor Gustav Mayr, Haupt Strasse 75, Vienna.

1880. Rev. John Stevenson, LL.D., F.R.S.E., The Manse, Glamis, Forfarshire.

1881. James Murie, M.D., LL.D., F.L.S., F.G.S., F.Z.S., Canvey Cottage, Leigh, Essex.

1884. David Sharp, M.B., C.M., Hon. M.A., F.R.S., F.L.S., F.Z.S., F.E.S., Hawthorndene, Hills Road, Cambridge.

1884. Robert M'Lachlan, F.R.S., F.L.S., F.Z.S., F.R.H.S., F.E.S., West View, Clarendon Road, Lewisham, London, S.E.

1885. Sir John Murray, K.C.B., LL.D., D.Sc., Ph.D., F.R.S., F.R.S.E., F.L.S., F.G.S., F.R.G.S., F.S.A.Scot., Challenger Lodge, Wardie, Edinburgh.

1887. William Carruthers, F.R.S., F.R.S.E., F.L.S., F.G.S., 14 Vermont Road, Norwood, London, S.E.

1887. Sir Joseph Dalton Hooker, M.D., R.N., G.C.S.I., C.B., D.C.L., LL.D., F.R.S., F.L.S., F.G.S., F.R.G.S., etc., The Camp, Sunningdale, Berks.

1888. Rev. Canon A. M. Norman, M.A., D.C.L., F.R.S., F.L.S., The Red House, Berkhamstead, Herts.

1890. M. C. Cooke, M.A., LL.D., A.L.S.

1895. Professor John G. M'Kendrick, M.D., F.R.C.P.E., LL.D., F.R.S., F.R.S.E., The University, Glasgow.

1901. Samuel Chisholm, LL.D., The Hon the Lord Provost of Glasgow, 20 Belhaven Terrace.

1901. Professor John Cleland, M.D., D.Sc., LL.D., F.R.S., The University, Glasgow.

1901. Professor J. W. H. Trail, M.A., M.D., F.R.S., F.L.S., The University of Aberdeen.

1901. J. A. Harvie-Brown, F.R.S.E., F.Z.S., M.B.O.U., Dunipace House, Larbert.

1901. Mrs. David Robertson, Fernbank, Millport.

1901. Mrs. Robert Gray, 59 George Street, Edinburgh.

1901. Andrew Carnegie, LL.D., Skibo Castle, Sutherlandshire.

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CORRESPONDING.

1866. The Earl of Haddington, F.S.A.Scot., Tyninghame, Prestonkirk.

1868. Rev. Paton J. Gloag, D.D., 28 Regent Terrace, Edinburgh.

1869. George Stewardson Brady, M.D., LL.D., F.R.S., C.M.Z.S., Mowbray Villa, Sunderland.

1869. Rev. James Keith, LL.D., The Manse, Forres.

1869. Col. H. W. Feilden, R.A., C.M.Z.S., West House, Wells, Norfolk.

1869. Rev. John Fergusson, LL.D., The Manse, Fern, Brechin.

1871. Peter Cameron, F.E.S., Union Road, New Mills, Derbyshire.

1873. Sir George Hector Leith-Buchanan, Bart., Ross Priory, Dumbartonshire.

1877. Robert Etheridge, F.R.S., F.R.S.E., F.G.S., Geological Department, British Museum (Natural History), Cromwell Road, London, S.W.

1879. John Smith, Monkredding, Kilwinning.

1879. Thomas Scott, F.L.S., F.R.Ph.S.E., Naturalist to the Fishery Board for Scotland, 3 Menzies Road, Torry, Aberdeen.

1884. W. Anderson Smith.

1885. J. T. Cunningham, B.A., Lecturer on Fishery Subjects, Penzance.

1885. John Rattray, M.A., B.Sc., F.R.S.E., Dunkeld.

1885. John R. Henderson, M.B., C.M., F.L.S., Professor of Biology, The Christian College, Madras.

1885. Frederick G. Pearcey, 43 Balcarres Street, Morningside, Edinburgh.

1885. James M'Andrew, 21 Gillespie Crescent, Edinburgh.

1887. Arthur Bennett, F.L.S., 143 High Street, Croydon, Surrey.

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1901. Thomson, J. R., 6 Vinicombe Street, Hillhead.
1877. *Thomson, James, I.A., 88 Bath Street.
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